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ABSTRACT

The Career Development and Information System (CDIS) is a longitudinal tracking system addressing itself to the distribution of new physicians in underserved areas, and in the field of primary health care as opposed to a specialty. It is comprised of several computerized modules. The Comprehensive Research, Evaluation and Assessment Module (CREAM) stores information on 1,200 variables collected from some 9000 students, and monitors and records the movement of these students into and out of various experiential opportunities. The Myers-Briggs Type Indicator Feedback Module (MBTI) provides students with information on their own preferred types of activities and psychological functioning. The Preceptorship Information Module (PIM) and the Residency Information Module (RIM) are computerized data files about various primary care preceptorship and residency programs across the country. The Work Setting Information Module (WIM) is a booklet describing the activity, time allocation, and allied health staffing characteristics of various specialties in different work settings. The System of Physician and Community Contact (SPACC) is a computer file of communities and physicians, focusing on underserved areas. With the system, it is hoped that the distinguishing characteristics of those who choose to enter primary care practice in underserved areas can be identified, and that the available information will be used in policy decision-making. (Author/BW)

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A Report on the Feasibility and Design of a Longitudinal Tracking System for Evaluating the Effects of Medical Student Preceptorships On Career Development Processes and Dispositions

Submitted by the
American Medical Student Association (AMSA) Foundation

FINAL REPORT-PART I

BHM Contract #231-75-0606

September 30, 1976

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A REPORT ON THE FEASIBILITY AND DESIGN OF A LONGITUDINAL TRACKING SYSTEM FOR EVALUATING THE EFFECTS OF MEDICAL STUDENT PRECEPTORSHIPS ON CAREER DEVELOPMENT PROCESSES AND DISPOSITIONS

Submitted to the Bureau of Health Manpower, DHEW by:

The American Medical Student Association (AMSA) Foundation in Accordance with Article II of Contract Number 231-75-0606

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SYNOPSIS

The Career Development and Information System (CDIS) is comprised of several computerized modules, each serving specific functions. These modules operate together to meld both research and applied functions in a manner which permits (a) the collection of a comprehensive data base which is relevant for addressing both the maldistribution problem of today and the unanticipated questions of tomorrow in this same area; and (b) the optimum application of present knowledge in ways which can begin to effect changes in the career path choices of today's medical students. The system addresses itself to the physician maldistribution problem on two levels.

A. Research Function

The research effort is a comprehensive longitudinal tracking study which focuses on student career development processes at various stages from entry through residency. It utlizies existing and accepted longitudinal methodology, but applies this methodology across some 20 schools, thus overcoming the critical limitations on institutional, geographical, and student population characteristics which have been typical of intra-school studies. The tracking system also avoids one of the biggest obstacles to using existing longitudinal data: comparability of instruments and data across schools.

The research effort is designed to result in a data base containing data on some 9000 students in 20 schools. The data are comprised of biographical, personality, attitudinal, clerkship, institutional, preceptorship experience, career preference, and residency experience variables. This information is stored in a computer file and results in a data base which (a) permits analyses of the processes of career development; (b) permits determination of the effects of various training experiences on student career dispositions, and consequently provides empirical results on which to base applied policy and funding decisions

aimed at encouraging students to enter primary care in shortage areas; and (c) because it is thorough, provides a data base which can serve to provide empirical rather than speculative answers to the unanticipated questions of tomorrow regarding physician manpower trends.

Comprehensive Research, Evaluation and Assessment Module (CREAM)

This module performs all of the functions necessary for developing, maintaining, and utilizing the tracking system as a data base for research. Its functions are: (1) to provide a permanent storage facility for approximately 1200 variables collected on some 9000 students from their first year of medical school into practice; (2) to distinguish students on the basis of different training opportunity structures which may be significant determinants of their ultimate career choices; (3) to monitor and record student movement into and out of the various experiential groups identified in the longitudinal study design; (4) to provide mechanisms for adding data to individual records as students progress through their career(s) and for adding new records (students) to the data base over time; and (5) to maintain a file of student names and addresses and procedures by which contact with students in the system can be maintained.

B. Applied Function

Past and present research on student career development suggests that students who are exposed to primary care training experiences return to medical school excited about and "turned on" to primary care practice. Their reactions come from experiences outside of medical school settings, however, and for too many students, this enthusiasm for primary care declines once they are back in school subject to formal and informal pressures from faculty specialists. Capitalizing on such research findings, the CDIS contains several modules which function to give students "windows" on primary care career alternatives through which they would otherwise have little chance of looking while confined to the

sterile labs and lecture halls of university medical centers. At several critical stages of career development and choice, the system provides students with information services which, judging from their responses to a questionnaire survey, they overwhelmingly agree are needed.

MBTI

This module provides students with information concerning their own preferred types of activities and psychological functioning, and compares these preferences to those of physicians practicing in various specialties. This system component is made available to students during their first or second year of school.

Preceptorship Information Module

This is a computerized file of information about various primary care preceptorship programs and sites across the country. Students are permitted to specify their preferences of program characteristics, locations, etc., and are in turn provided lists of programs meeting their criteria, along with a brief description of each program and application details. This component is offered to students during their clinical years.

Residency Information Module

This is a computerized file of information about primary care residencies across the country. As with the above preceptorship module, students may indicate preference criteria and are sent listings of programs which satisfy their preferences. This file is designed to include family and general practice residencies in the first year of operation, with additional primary care residencies to be added in subsequent years. The module provides students with information concerning characteristics of residency programs, and is thus prior to the National Internship and Residency Matching Program, which primarily functions as an applicant/program clearinghouse. The module functions

as an informational guide for students and provides them with an informed basis for making application to those residency programs which suit their interests and preferences. It is offered to students during their junior and senior years.

Work Setting Information Module

This is a specially designed booklet of information on the activity, time allocation, and allied health staffing characteristics of various specialties as they are practiced in different work settings. Based on data collected from physicians practicing in different work situations, this module allows students to explore the characteristics of various specialty/work setting combinations about which they may be interested in learning more. The module gives students information about the ways in which various specialties may be practiced outside of university medical centers, and is available to students in any year.

System for Physician and Community Contact

This is a computer file containing listings of communities and physicians. Each may request from the module a listing of those communities or physicians whose preferences match their own. It also provides physicians with listings of other physicians who are seeking or interested in partners or associates. Its focus is on communities in shortage areas which lack adequate health care. It will be available to physicians nationwide, but during its first year of operation will include communities in a limited region.

The research and applied components of this entire system each offer something of value in and of themselves, yet the effect of the system when coordinated as a whole can be greater than the sum of its parts. The tracking component, for example, makes it possible to determine the distinguishing characteristics of those individuals who choose to enter primary care practice

in shortage areas. Some of these may be personal characteristics while others may be training experiences. If such individuals can be identified, it should then be possible to offer others like them "special" experiences (either preceptorships or residencies) at self-sufficient model practices in shortage areas. The funding of such special programs would make it possible to give these students first-hand experience with the clinical and non-clinical aspects of operating practices in shortage areas and the peculiar problems associated with such practice models.

Such programs, by giving students prior exposure, would increase the chances of their entering similar practices of their own and of being successful at them. Such a prospect goes beyond the immediate efforts of the present system but is a natural extension of it. Implementation of the research and applied functions of the system described here would bring such a "next step" much closer.

I. INTRODUCTION

Complex situations usually results from a multitude of contributing causes. Such is the case for the problem of medical care maldistribution in this country. Because the problem itself is multi-faceted, potential solutions to it should involve the coordination of several different but complementary approaches. Any single method of solution to this problem is destined, even if effective, to alleviate only a relatively small aspect of the total situation.

It has been said that "If the only tool you have is a hammer, you tend to treat everything as if it were a nail." Such would appear to be the case with governmental attempts to deal with the health care maldistribution problem. With the legislation of financial support as a prime tool, governmental solutions have typically focused on the provision of financial incentives to physicians and financial support to medical education contingent upon styling this education to produce the desired kinds of doctors.

Money as an incentive and as a contingency for support of ecuational programs may indeed be effective methods for some physicians and some aspects of the problem. However, use of these techniques has too often been based upon the assumption that they will be effective, rather than sound knowledge that this is the case. Governmental financial support of a wide range of medical student preceptorship programs in primary care is also based upon an assumption of effectiveness. Until recently there has been little interest in investigating the validity of the assumption.

Although money as a direct solution to the problem may produce limited results, it can as an indirect method vastly expand the potential methods of alleviating medical care maldistribution. Money buys knowledge and knowledge provides the means whereby solutions whose effects may be estimated (rather

than merely guessed or assumed) can be discovered and implemented. Thus the financial tools available to the government for problem resolution may be seen not as inappropriate, but rather as inappropriately utilized.

The general goal of the longitudinal tracking and information system proposed here is the generation of a broad spectrum of knowledge which may be used by a number of agencies, institutions, and individuals to facilitate solutions to various aspects of medical care maldistribution. Potential users of the system include government policy-making bodies, medical education institutions, individual medical students and physicians, and communities seeking to provide medical care for their members. A basic premise underlying the comprehensive system is that since no single method will be sufficient to solve the problem, several approaches must be exploited concurrently, each of which may provide solutions to different aspects of the problem. While the several components of the system may be implemented separately, it is our belief that the greatest value accrues from coordination of the entire system; that is, the effect of the whole would be greater than the sum of the effects of its parts.

As stated in the original contract, the motivation for this system is the evaluation of the effects of preceptorship experiences on students' dispositions to enter primary care in underserved settings. During its development, however, the system evolved in such a manner as to include components which enable it to serve several goals. These components not only provide a better and cheaper means of achieving the original goals, but also permit the system to address and deal with other facets of both medical student career development and health care shortage problems. The goals served by the system are the following:

1. To evaluate the long-range effects of preceptorship programs on physician career development;

2. To generate data representative of trends in physician career dispositions;
3. To generate data regarding how career decisions are made and the "causes" of career dispositions or choices;
4. To facilitate career decision-making and the placement of physicians in underserved settings by providing information service to medical students, physicians in training and in practice, and communities seeking physicians.

These goals obviously go beyond the specifications of the original contract, and yet the serving of these goals arises naturally out of the design necessary for achieving the original purpose.

The first three goals can all be serviced by the same body of data. The importance of these goals cannot be over emphasized. Speaking in terms of general cost-accounting, it is usually cheaper in the long run (a) to implement informed policy decisions whose effects can at least be qualitatively predicted, rather than to take actions based on unproved assumptions and whose effects are only assumed; (b) to know ahead of time what trends are developing in health care delivery and take appropriate informed action to correct any undesirable developments rather than wait and discover the problem only after it is acute and then try to guess what corrective actions might have some "guesstimated" effect; and (c) at least to attempt to assess the effects of one's policies if one does in fact find himself having to take action before enough information is available for a sound policy decision. Compared to the money expended on preceptorship programs (when it was not know whether those programs actually would have desired effects on students' dispositions to enter primary care in shortage areas) the money needed for the system proposed here would appear to be a wise investment. It would appear even more so considering the knowledge base that would be available from the proposed system

for making much more informed policy and/or funding decisions on a broad range of fronts in medical education and health care delivery.

The fourth goal is served by the strategies designed to operate the system efficiently and successfully, i.e., to overcome some of the problems inherent in tracking large numbers of students over a period of several years. More importantly, these strategies (which appear in the form of the information service modules to be described later) deal actively with some of the facets of the maldistribution problem. While operating as important components of a research system designed to generate a knowledge base for policy-making, these modules go beyond research and provide for positive actions to be taken by the system at critical decision points of medical students career development.

In short, the system provides the opportunity to determine the relative influence on career choices of a variety of factors and to identify the most effective points of intervention in career development for policy makers wishing to effect desired changes in the outputs of the physician production system. This proposed system also initiates active intervention in the form of information/service modules which show students some career path alternatives of which they might not otherwise be aware.

Before turning to the system components themselves, we first look at some of the considerations and concerns involved in the design of the overall system. The following section may be skipped by those familiar with experimental design; it provides the methodological rationale for the sample design used in the system.

II. ISSUES IN EXPERIMENTAL DESIGN

A. The Concept of Cause

A central concern of experimental research in general and evaluation research in particular is that of determining which phenomena (or "causes") produce which effects. (On philosophical grounds the term "cause" is suspect; however, we shall use it here in its lay sense, noting that even though philosophers of science disdain usage of the term, scientists themselves often behave as if it were a legitimate concept.) Implicit in the concepts of cause and effect is the notion of change: something must first change and be followed by a change in something else before we can even begin to speak of cause and effect. Hence it is necessary that we be able to observe, i.e., measure, such changes in our research. The problems of measurement are beyond the scope of our discussion here, except for noting that reliable and valid measurement is a necessary part of the research endeavor.

Also implicit in the concepts of cause and effect is the notion that there is some kind of link between the phenomenon labeled "cause" and that labeled "effect". In the physical sciences, this link is often characterized as being necessary and sufficient. That is, whenever A occurs it will always be followed by B, and B will never appear unless A is present. In the social sciences, the causal link is nearly always characterized as being probability (rather than certainty) that B will follow. Necessary and sufficient conditions are virtually non-existent in the social sciences, and the reasons for this are directly relevant to the complex issues and problems arising in evaluation research.

In the social sciences, there are two basic observations which have profound consequences for all research endeavors. (a) Any single phenomenon is likely to have many effects. The death of a spouse may affect an individual's

behavior in many areas of his life. (b) Any given effect (behavior) may occur for a variety of reasons. The choice of a given career may be due to a variety of present circumstances, personality characteristics, and past experiences. In addition, there is the further complication that nearly all human behavior occurs in contexts comprised of a multitude of physical, social, and social psychological factors any of which are capable of affecting behavior.

B. Control

In the face of such situational and behavioral complexity, the task of determining which phenomena produce which effects requires an appropriately complex research strategy. At the heart of any research endeavor which seeks to explain behavior is the concept of control. Very generally, control in the research design sense may be thought of as an attempt to determine the causal links between or among phenomena by means of a complex pattern of observations, measurements, and/or statistical analyses. Unfortunately, the world very often does not offer to the scientist the kinds of observations which would enable him to make some statement about causal linkages; hence he must utilize the controls available to him in order to obtain the pattern of observations which will unequivocally tell him what he wishes to know.

C. Strategies of Control

There are many different strategies for achieving control in research designs. We shall discuss three general categories of control here. In practice these may not necessarily be distinct, but we separate them here for heuristic purposes.

1. Control may be achieved directly by manipulation of the phenomenon whose affects are being determined. For example, a researcher may expose a subject to varying intensities of light to determine the effects of light intensity on the aperture of the pupil. If the pupil size

changes with changes in light intensity, then, providing no other aspects in the experimental situation varied during the experiment, it may be concluded that light intensity does affect pupil size.

This example is quite simple, but it does illustrate some critical points. (a) In order to determine the causal relation above it was necessary to observe changes in the cause (light intensity) and to see if these were accompanied by observable effects (changes in pupil size). (b) To ascertain whether changes in pupil size were due to changes in light intensity and not to some other cause, it was necessary to be certain that no other aspects of the experimental situation changed concurrently. Had the color of light in the room also changed simultaneously with light intensity, we could not really be sure which of the ostensible causes was responsible for changes in pupil size. Thus control in this example involves two things: directly manipulating the independent variable ("cause") during the experiment, while making certain that all other variables (potential causes) remain constant.

2. Control may also be achieved by statistical analyses. In many cases it may not be possible to manipulate directly the variable being studied, nor to make absolutely certain that all other variables in the research situation remain constant during the investigation. In this case, statistical analyses using measurements of variables being studied can tell the researcher whether the changes in the independent variable (cause) and in the dependent variable (effect) are indicative of some kind of causal link between the two variables. Statistical analyses can tell us how much of the observed change in the dependent variable was due to change in the independent variable, and how much was accounted for by other variables in the situation.

3. In some cases it is possible in social science research to manipulate the variables being studied, the people who are placed in the experimental situation, or both. Subjects may be manipulated by placing them in situations in which they may or may not be exposed to one or more of the variables whose effects are being studied. The rationale behind this procedure is that if we want to know what effect a given independent variable (say, a piece of advertising) has on a given dependent variable (say, buying behavior), we should expose one group to the advertising and compare their buying behavior with a group who did not see the advertising. If the behavior of the group who saw the advertising is different from the group who did not see it, we may conclude that the difference is due to the ad, providing the two groups were initially alike in every respect except exposure to the ad. This latter point is important, because only when the two groups are alike initially in every respect can we draw such a conclusion. Having the groups be alike initially is the one way a researcher has of making sure that variables other than the ad are not responsible for the difference in buying behavior. The reason for this is that people bring with them to any situation a whole repertoire of past experiences, attitudes, personality characteristics, etc. which may affect their subsequent behavior. The researcher must take these characteristics into account in the design of his experiment, i.e., he must make certain that they do not influence the results of his study in ways which are unknown to him. By making the groups alike initially he is able to say that any final differences in buying behavior must be due to the only difference between the groups, i.e., exposure to the ad.

In reality the problems are much more complex than the examples would suggest. Even in controlled laboratory situations, there are many more variables present than the researcher can identify, let alone measure

or control, and all of them have the potential for affecting human behavior. Human beings respond to an incredible array of social and physical stimuli of which they are not even consciously aware, such as background colors, body posture, and pupil size. There are many methods of dealing with these unknown stimuli in the laboratory; our problem here is concerned with behavior in the real world where the control capabilities of the experimenter are considerably reduced. There are several issues we shall review briefly, some of which are general to all experiments, and others of which are peculiar to "natural" experiments or research done in the field.

D. Problems of Control in Natural Settings

One significant problem confronting research done in natural settings is that very often the researcher cannot control which subjects are assigned to which groups. Consequently, he cannot make certain that the groups are alike to begin with. He may test them on certain variables to determine whether they are significantly different with respect to any of them, but it is really impossible to do this for all of the independent variables which might affect the dependent variable(s). Quite often subjects in natural settings elect to enter certain programs which are to be studied, such as preceptorships. By the very act of applying for such programs, these subjects have already indicated that they are in some ways different from other medical students who did not apply to them. In preceptorship programs particularly, it may be the case that program applicants are different in ways which might affect or account for their behavior with respect to dependent variables, such as preference for primary care.

Another problem in natural settings is the inability of the researcher to control certain variables he wishes to study. He has no choice but to let them vary as they would naturally, and there are several problems which may

occur as a result. One of these is that he may not be able to observe the range of variation that he would like. A researcher studying the effects of exposure to sunlight on incidence of skin cancer in Massachusetts, for example, would not have available to him places receiving more than 4000 hours of sunshine annually. Even if there were such places in Massachusetts, they still would not receive the intensity of sunlight found in places at higher altitudes, such as New Mexico. In this case, the investigator would simply have to search longer and harder to include the range of exposure he was seeking.

A somewhat similar problem is that the researcher may have variation where or when he does not want it. If the effects of preceptorship programs on preference for family practice are being studied, for example, it may be the case that those programs which fall under the rubric of "preceptorships" may vary considerably with respect to such things as length of program, type of activities students engage in, number of contacts with other allied health personnel, type of patients treated, etc. It is quite likely that it is the details of the program's activities which have an effect on a student's career preference, not whether the program has been given the name "preceptorship." In other words, sometimes phenomena with the same name will in reality be very different things, and the researcher working in natural settings must be cognizant of this possibility.

A different but related problem is that natural variation may not occur among those groups the researcher wishes to study. For example, if he wishes to study the incidence of skin cancer among different national groups, he may find that there are few if any fairskinned Scandinavians living in New Mexico. Hence it would be impossible to compare Scandinavians and Mexican-Americans since the two groups are not found living under comparable conditions.

Not only is it often true that the researcher cannot control the variation

exhibited by some variables in a natural setting, but he also may not be able to control which variables his subject populations will encounter. The natural world is full of events and situations which can never be under the control of an investigator, and if experiments are done in natural settings, his subjects will be exposed to myriads of uncontrolled variables: television, newspapers, discussions with friends, financial crises, accidents, deaths in the family, etc. Some such variables will not have any effect on the dependent variables he is studying, particularly if it happens to be some kind of biological variable. If it is a social or psychological variable, however, the chances of some effect occuring are much greater. The real problem for the social scientist is that since he cannot control these variables, he cannot know which ones of them are responsible for unexplained variation in his dependent variable.

Another problem inherent in any attempt to identify causal linkages is that of delayed effects. While it is perfectly obvious that any cause must come before its effect, it is not so obvious just what the time interval between the two is or should be. Some effects show up almost immediately after their cause; others take longer. Exposure to sources of infection or disease may not be followed by illness for hours, days, or even weeks. In the realm of behavior, the time interval may be even longer. Some studies attempting to determine the effect on attitudes of a film dealing with racial prejudices found that shortly after viewing the film subjects' attitudes had not changed. Testing nine months later, however, revealed that by that time attitudes had changed significantly.

It might be argued, of course, that in this case the investigator was attributing the changed attitudes to the film when he really should have attributed it to some (perhaps unknown) variable to which subjects were exposed during the nine month interval. It might very well be that something occuring

during that time was responsible for or at least helped change subjects' attitudes; a check comparison with a comparable group who had not seen the film would help in answering this question.

E. Interaction

Even if the comparison with a group who had not seen the film indicated that the film appeared to be the causal factor, i.e., after nine months the group exposed to the film had changed but the comparison group (who had not seen the film) had not, there is still another possible interpretation of the results. This interpretation is that there was some kind of interaction between seeing the film and some unknown variable intervening between exposure to the film and the final attitude test nine months later. This point deserves fuller consideration since interaction among independent variables is a phenomenon which may occur in any setting, experimental or natural.

Interaction may be thought of as the effect which occurs when two or more variables, acting together, produce an effect which is different from the sum of their separate effects. If we consider only independent variables, sex and socioeconomic status (SES), and if we find that (a) being male gives one a 7% chance of being a juvenile delinquent, and that (b) being lower class gives one a 14% chance of being delinquent, but that (c) being male and lower class gives one a 38% chance of being delinquent, then we may conclude that sex and SES have an interactive effect on juvenile delinquency.

The problem of potential interactive effects can be seen in perspective if we consider that every social setting consists of not two but countless variables which may be capable of affecting human behavior. The more variables there are in a given situation, the greater the possible number of pairs of variables which may interact. Furthermore, interactions are not limited to second-order effects (consisting of a pair of variables). Interactions may

result from any number of variables acting together. The actual number of variables which may be involved in an interaction is limited only by the total number of variables in the situation.

When we consider that natural experiments generally expose subjects to more unknown and uncontrolled variables than laboratory experiments, that natural experiments occur in settings over fairly lengthy time periods (days, weeks, months, and years contrasted to the minutes or hours of laboratory experiments), that longer time periods allow a greater number of variables to act on the subjects, and that a greater number of variables makes for a potentially greater number of interactive effects, the complexity of research efforts in natural settings becomes apparent. There are mitigating factors, however, and it is generally the case that only a few of the possible interactive effects and only relatively few of the unknown uncontrolled variables actually do exert any effects on the dependent variable(s) being studied. Nevertheless, unless the researcher has some theory or previous research to guide him, he may have no idea which uncontrolled variables or which interactions might be significant.

A major consequence of the considerations mentioned above is that in natural experiments, where there are very large numbers of variables and interactions to take into account, the controls which must be used are quite complex. Statistical controls, as well as controls achieved through design specifications (identification of the different groups one wishes to observe) require large numbers of subjects when attempts are being made to control for large numbers of variables and interactions. We cannot go into the technical details here except to note several points: (a) variables may be measured as categories (e.g., male/female) or in terms of amounts or rankings (e.g., scales rated 1 to 7); (b) attempts to isolate or single out the effects of separate independent variables

requires two groups per variable if the variables are measured in terms of categories or if one cannot obtain observations over the entire range of variables measured in terms of amounts; (c) the number of groups required with each additional independent variable considered increases multiplicatively rather than additively. For each group specified in the design of the study, it is necessary to have an ample number of subjects in order to make certain that the effects being studied in that group may be reliably assessed. Group sizes of 10, 25, or even 40 are too small for most purposes.

Variables which can be measured in terms of amounts can be controlled statistically, which is one major reason why it is desirable to measure as many variables as possible in this manner (see Section III C).

Yet even this strategy leaves the researcher with many categorical variables to deal with, and consequently he must select his groups in such a way as to maximize his chances of differentiating them on the basis of causally relevant variables. The number of groups he chooses to build into the design of his study and the variables by which he differentiates them will, of course, be limited by cost factors and other practical constraints.

In spite of the complexity of the issues in experimental design, the researcher does have some potentially powerful aids which can help him overcome what would otherwise be insurmountable obstacles. One of these consists of the body of accumulated knowledge in his field. Previous studies which have been done either in the lab or in restricted natural settings may provide him with a wealth of information on which to base some decisions which would otherwise have to be made arbitrarily and perhaps in ignorance. This reason alone is sufficient to justify adoption of the guiding principle that no large-scale social research should be done in natural settings on natural popluations until there has been accumulated a fairly extensive body of research knowledge based

on smaller-scale studies done in the same or related areas. Fortunately, in the case of preceptorship program evaluations, we find that this has indeed been the case. Thus, any such evaluation research would have the benefit of the results of research in closely related areas of medical education and career choice.

Another powerful tool which can be employed in an evaluation study of preceptorship programs is replication. This is a very useful tool for determining the relative importance (or lack of it) of innumerable seemingly trivial setting variables which just might have affected one's results in a given setting. These might be things such as climate, weather conditions, knowledge of current newsworthy events, etc. They may also be such things as institutional variables which characterize the medical schools attended by preceptees. Study of preceptees or control groups from more than one medical school, geographic area, etc., can enable the researcher to determine the extent to which certain categories of unmeasured and even unknown variables influenced the results he has observed.

III. DESIGN

Selection of an appropriate design for evaluating the effects of preceptorship experiences on career preferences requires that we identify to as great an extent as possible those categories of variables which are likely to influence such preferences. This is necessary because it is difficult to control unknown influences in research in natural settings and because the nature of known influences in part determines the study design.

Fortunately a great deal of work has been done during the past two decades on career preferences of medical students, and consequently we know what kinds of factors are important. For a review of the literature in this area, Otis et al. (1) is a good source. Our discussion will proceed in terms of general categories of these variables with specific variables to be mentioned only for purposes of illustration; this will be adequate for allowing us to determine our design specifications.

A. Independent Variables

For purposes of discussion, three categories of independent variables may be identified: student input characteristics, experiential factors, and institutional characteristics.

1. Student Input Characteristics:

These are the variables the student "brings with him" to any situation. Some of them are more or less permanent, while others are maleable and will change as he undergoes new experiences. Among this category of variables may be recognized the following:

a. Student Background Characteristics (biographical data).

This includes such factors as sex, SES of family of origin, size of community of origin, college attended, marital status, sibling

position, etc.

b. Personality

There are many personality inventories in use, not all of which have been found to be useful in explaining career preferences. Those which appear to be most useful are those identifying preferred modes of psychological functioning and ways of dealing with one's environment. The Myers-Briggs Type Indicator (MBTI) appears to be very useful in this respect (See Appendix A).

c. Attitudes

It is widely known by now that attitudes and behaviors are not always highly correlated. Nevertheless they are quite useful in predicting general behavioral orientations. For our purposes here, we are mainly interested in those attitudes and expectations dealing with the various student, peer, allied health personnel, faculty, and physician roles encountered during the process of medical training. Otis and Mitchell (2) found such attitudes to be significant predictors of career dispositions, including practice model preferences.

2. Experiential Factors

These are characteristics of the various formal and informal training experiences which students undergo during the process of becoming physicians. Some of the informal experiences are difficult to assess and have not even been adequately conceptualized in the literature. While these informal experiences appear to be important, perhaps the best way of handling them at present is to include adequate measures of attitudes as mentioned above. The formal training experiences are somewhat easier to deal with, and they include the following:

a. Clerkships

These are often the medical student's first chance to actually encounter patient care, either by observation or participation, unless he takes a first or second year preceptorship. The important things here are, among others, the nature of coaching and criticism the student receives, amount and nature of informal contact with faculty, the kinds of cases and patients observed, the treatment practices observed and learned, and the specialties in which the clerkships are taken.

b. Preceptorships

In general terms, two types of preceptorships may be distinguished: pre-clinical and clinical. Preceptorships taken during the freshman and sophomore years are predominantly observational (although there are exceptions), whereas those taken during the junior and senior years are nearly all clinical, involving direct patient care on the part of the student. Both are important in "turning students on" to primary care; however, the main difference between the two types of experience is in what the student is exposed to and gets to see versus what the student actually gets to do. For pre-clinical experiences we may wish to focus on the situational context and observational content of the experience. For clinical preceptorships, our focus should be on such things as program characteristics (e.g., frequency of engaging in various activities such as physical examinations, discussing or setting fees with patients, ordering lab tests, making diagnoses, prescribing treatment, and working with different kinds of health professionals), site location, community characteristics, etc.

c. Other Formal Training

This refers primarily to internships and/or residencies. Choice

of residency is obviously a good indicator of career dispositions, but it is also true that many students either change residency programs or change specialty during residency. The kinds of variables important here are similar to those for preceptorships, the difference being a greater focus on clinical experiences and responsibilities and orientation or philosophy of treatment.

3. Institutional Characteristics

In view of the facts that different schools turn out different numbers and proportions of specialists among their graduates and that their philosophies and "missions" are different (e.g., Johns Hopkins is oriented toward producing academicians, whereas Tennessee tends to produce more general practitioners; see Otis et al (3)) institutional variables would appear to be significant factors in accounting for career dispositions. Among such variables might be included admissions policies; number and timing of electives; nature of core curriculum; amount of federal funding for research, clinical training programs, and community health care programs; and percentage of graduates entering various specialties.

In addition to the independent variables, there are a variety of dependent variables associated with career decisions which should be assessed.

B. Dependent Variables: Career Dispositions

Besides specialty preferences, we should also know something about student preferences for such things as practice models, allocation of professional effort, geographic area, community size, and type of patients. It is the choices made with respect to these factors which ultimately determine which niche a physician enters, i.e., whether he sets up his own solo practice as a primary care physician in a small rural community or whether he becomes an administrator in a major university medical center.

C. Methods of Control Applicable in the Present Study

Having identified the categories of variables which must be taken into account, we are now in a position to specify the kinds of control which must be applied to these variables in order to evaluate the effects of preceptorship experiences on career dispositions. Since the study is to be done in natural settings, we are not able to manipulate directly either variables or people. Consequently we are limited to controls of a statistical and observational nature, and the best we can do is to select those observations and measurements which will enable us to answer questions concerning the effects of preceptorship experiences on career preferences. More specifically, we wish to select those controls which will permit us to determine not only whether preceptorship experiences increase students' dispositions to enter primary care, for example, but also to determine what aspects of these experiences appear to be (a) most important in influencing students' career preferences, and (b) most potentially manipulable from a policy-making standpoint. Consicely stated, those variables which can be measured on all students in our sample may be controlled statistically; those variables for which measures are not available on all students are best controlled observationally. The reasons for this will be discussed in more detail below.

1. Statistical Control

The variables which can be controlled statistically include all those mentioned above except for preceptorship experience variables. That is, measurements of biographical, personality, attitudinal, clerkship, residency, and institutional factors can be obtained from all subjects and controlled statistically to assess their single and interactive effects. An important consideration in assessing these variables is the way in which they are measured. Most multivariate procedures assume interval level measurement, although recent developments in regression analysis have produced means

of dealing with dichotomous variables in regression equations and of constructing ordinal path models. The intricacies of the latter are still being debated, however, and the use of dichotomous or categorical variables results in some messy statistical and interpretative problems, particularly when the number of such variables is large relative to the number of interval variables. For these reasons it is desirable to measure as many of the statistically controllable variables as possible at the interval level of measurement, i.e., on a 7 or n-point scale.

The above reasons alone are perhaps sufficient for measuring at the interval level, but there are other reasons as well for avoiding open-ended, ranking, or categorical responses. Open-ended responses are extremely difficult to code reliably. Even if the problems of coder agreement and interpretation can be solved (and they are usually never solved completely), error rates in the coding of such data are much higher than four more structured kinds of data (see Morrisey (4); Kammeyer and Roth (5); and Scott (6)). Each time data are coded, transformed, or transferred from one form to another the process must be checked, for errors inevitably occur at each stage of handling and preparing the data for analysis. If checking is not done at each stage, the errors accumulate and are not likely to be found until analysis of the data is underway (if then). What this means in practical terms is that the time and personnel costs of handling less structured data are considerably greater than for structured data. Research assistants must be hired to do the coding and checking of coding, and for the large amounts of data envisioned for this study, the costs would be considerable; and the result would still be data that would be difficult to handle in the analysis state anyway. With structured questionnaires in which responses are pre-coded on a 7-point scale, time and personnel costs are reduced and the data are much more easily handled in

multivariate analyses.

2. Observational Controls

The preceptorship experience data are best handled by selecting patterns of observations which will tell us the kinds of things we wish to know about the influence of these experiences on career preferences. It would be possible, of course, to merely record the presence or absence of a preceptorship experience and use this observation in our analyses; but this would not yield the more detailed, precise kind of knowledge which would be useful in telling us what aspects of preceptorship programs are responsible for affecting career dispositions. If our study is to be useful, it should permit us to identify those program characteristics which are most influential in affecting the career choice process; only in this way can preceptorship progams be assessed and/or altered optimally in terms of effects on students' decisions to enter, say, primary care in underserved settings.

There are several patterns of entry into preceptorships which we may wish to observe. Students find themselves in various opportunity structures over which they have varying degrees of control. Their behavior within the context of these opportunities is significant for our purposes, for it involves certain elements of self-selection which may be relevant to our assessment of the influeence of preceptorship experiences on career choices. There are several points about opportunity structures which should be noted. First of all, some schools require that all their students take preceptorships as part of their training. Other schools have optional preceptorship programs; that is, students may or may not choose to take preceptorships during their undergraduate years. Finally, some schools offer no preceptorship experiences as part of their curricula.

By selecting our observations to include all of these circumstances, we have the chance to determine the effects of several naturally occuring situations. Students at the first type of schools must take preceptorships regardless of their own preferences. We have here the opportunity to determine whether students who are disinclined to take such programs will change their career dispositions as a result of such required experiences. Such information could have significant consequences for government agencies interested in determining which kinds of programs to fund in order to affect the physician production system in desired ways. Students in the second type of schools offer us the opportunity to determine (a) in what ways those who elect to take preceptorships are different in background, personality, attitudes, and career preferences from those who do not take them; (b) whether students taking preceptorships subsequently differ from other students in their career choices; and (c) to what extent the preceptorship experiences account for differences in career preferences. Students attending schools not offering preceptorships present us with the opportunity to determine (a) to what extent students with reduced opportunitites for entering preceptorships exhibit career preferences similar to or different from those to whom such experiences are more readily available; (b) to what extent self-selection vs. the preceptorship per se explains subsequent career preferences. If self-selection is an important factor, it would be possible to determine the degree to which student characteristics interact with preceptorship experiences in affecting career preferences. It may be, for example, that self-selection is an important factor, but that the preceptorship experience is an important catalyst for those students who are motivated to seek out such experiences. Untangling the effects of these factors would appear to be highly relevant to government agencies who are considering whether or not to fund open preceptorship programs such as those administered by the AMSA Foundation.

The pattern of observations required to control the factors mentioned above and to unravel their effects is incorporated into our study design in the form of the sample. The considerations involved in the selection of a sample warrant an extended discussion and are taken up in the next section.

D. Sample

At this point our discussion of the sample will focus exclusively on the nature of the sample necessary for evaluating the effects of clinical preceptorships (i.e., those taken during the junior and senior years). There are several reasons for basing the sample mainly on the requirements of evaluating the effects of these junior and senior preceptorships. First of all, as will become apparent later, once we have obtained a sample on this basis, we will also have the sample needed for evaluating effects of pre-clinical preceptorships. Second, clinical preceptorships offer many more potential "handles" for altering the nature and effects of these experiences in desired ways, and thus for (hopefully) affecting the career dispositions of students. Third, the varied nature of clinilcal preceptorship experiences requires a more complicated sample. For these reasons, the sample required for evaluating the effects of clinical preceptorship experiences will be described as if these were the only programs to be studied. After this sample has been described, we shall then look at the rather small additional effort that would be necessary for assessing pre-clinical preceptorship experiences also.

Definition of a Clinical Preceptorship

A clinical experience of four or more weeks in an off-campus underserved setting (inner city or rural) in which a junior or senior student participates directly in patient care in a primarily non-hospital environment (e.g., community or private clinic or a physician's office). Preceptorships may include

programs labeled as clinical clerkships if they meet the definition above.

The preceptorship experience may either be (a) required by the student's medical school; (b) offered on an optional basis by the student's school; or (c) not associated with a student's school, e.g., it may be offered at a different school or may be a non-medical school program such as those sponsored by the AMSA Foundation.

A total of 88 programs listed in the National Health Council's Directory of Preceptorships meet the definition above. Of these, 56 programs are open to all medical students in the country, although some of these are primarily offered to students at the sponsoring institution. Of these 56, 20% are required for students at the sponsoring school. The remaining 32 programs are closed, i.e., they are not open to all medical students in the country. Of these 32, 38% are required for students at the sponsoring school, while the remaining 62% are offered on an optional basis to students at that school.

Of primary concern for our purposes here is the nature of the preceptorship opportunities available to medical students. We see, as mentioned earlier, that some students are required to take preceptorships, others have the option of taking them through programs offered by their own school, while still others must look to programs outside their own schools for such experiences. These opportunity structures give us the five basic groups identified in our sample in Table 6 (Section V B).

1. Sample Rationale: Design

The purpose of distinguishing the five groups appearing in Table 6 is to determine the effects of the preceptorship opportunity structure on students' career preferences. These are several critical questions which may be addressed by observing these groups. Some students entering these

preceptorship programs do so on a self-selective basis; that is, their inclinations prior to the experience lead them to seek out such experiences. This is true for those entering the programs on an optional basis. It is important to determine how these students are different from those who do not elect the preceptorship option and whether the differences may account for career preference differences, if any. Further, it would be useful to determine what effects the experience has on their career plans once they have selected themselves into the programs.

This sample also gives us the opportunity to determine to what extent required preceptorship experiences influence students to enter primary care who might not otherwise have done so. The answers to these questions have significant implications for policy-makers wishing to fund programs which will encourage students to enter primary care niches.

2. Sample Rationale: Size

There are several concerns bearing on the question of sample size, not all of which yield any precise numbers with which to work. As a result, the sampling procedure must be flexible enough to permit adjustments in later years as necessary.

The numbers presented in Table 6 are the desired sizes of each sample group by year n + 4. Since some attrition from the initial sample can be expected during the period of this study, the initial sample sizes must be larger than these figures. As a first approximation, we might wish to begin with an initial sample size for each group which is 50% larger than the n's presented in Table 6. Some of the factors which can be expected to affect attrition rates will be mentioned briefly.

Some attrition can be expected from students dropping out of school or

from their taking a year off and resuming study later. Experience at the Longitudinal Study at New Mexico indicates that the expected loss from this cause varies from year to year but runs on the average up to 5% per class. Experience at the same school also indicates that among those students who do remain in medical school, complete data over the four years of undergraduate training is available for about 60 to 70% of students; and these figures come from an ongoing study at the students' own medical school where payment is received for each set of questionnaires completed.

In the present proposed study, the situation is somewhat different. Payment may not be available (this question will be dealt with later) and the study will not be housed at the student's own medical school; consequently attrition rates may be expected to run somewhat higher. There are mitigating factors which can be employed to reduce the rate, however. First of all, it would be highly desirable to have questionnaires administered by a contact person at each medical school, so that students could have direct access to someone involved in the study at their own school. This would greatly increase the response rate over a mailing system, although precise figures are not available for the amount of the difference. Second, were the system as a whole to be made operational, there would be incentives other than payment which could induce students to remain in the system. Feedback from various service modules could be scheduled so that students would obtain some positive, concrete benefits by remaining in the system. Feedback in the system as envisioned would be comprised of (a) MBTI information concerning the student's own personality preferences and the preferences of various categories of physicians in practice; (b) a preceptorship information service (PIM) which would provide students with information concerning preceptorship sites and programs, application procedures, and ratings of preceptorship experiences at sites by previous

preceptees; (c) a residency information service (RIM) concerning residency programs in, say, primary care specialties; (d) a physician placement service (SPACC) which would enable a physician entering practice to obtain information about communities in a given geographic region which matched his preferred criteria or about other physicians seeking partners; and (e) a work setting information service which would provide students with descriptive information concerning various career niches (combinations of specialties, practice models and/or work settings).

There are several limitations to these incentives, however, and these limitations are differentially relevant to the various sample groups. The comparison groups will quite likely include students who are not interested in primary care specialties. Thus, the service modules providing information about primary care preceptorships, residencies, or positions open to primary care physicians would not be particularly appealing as incentives to them. Attrition from these groups can thus be expected to be higher than for the preceptee sample groups, who presumably are more likely to be interested in primary care. It should be noted here that some students who are in the comparison groups initially may decide to take preceptorships, and thus some attrition will occur as a result of these students moving into different sample groups. Such movement may be higher if the preceptorship information service is made available to students in the comparison groups. This movement would not necessarily be bad, since it would provide some important data on the effect such a service would have in terms of encouraging students to enter preceptorships. It would only mean that the comparison group samples might be reduced by a rough estimate of from 50 to 10%.

The preceptee sample groups, on the other hand, are more likely to

find the service module incentives attractive and therefore are more likely to remain in the system. However, there are three preceptee sample groups, and it is important to have enough students in each group to perform multivariate analyses.

One other factor influencing attrition is the magnitude of data to be collected from students. There is a fatigue factor which is encountered in administering several instruments to subjects. The point at which this factor begins to affect a student's continued participation in the study varies with the student, his circumstances, and the incentives he has for remaining in the study, and consequently it cannot be estimated precisely. For this reason, it will be necessary to make adjustments in sample sizes each year to reflect observed attrition rates among various sample groups. If the attrition rate is higher than expected, the next year's sample should be increased for the appropriate groups.

The goal of generating trends in career choices of students requires, in addition to having adequate comparison groups for contrasting their career paths with those of preceptees, that we have comparison groups of a size adequate to be representative of medical students in this country. For this reason, and in view of higher expected rates of attrition from comparison groups, it is proposed that 1500 comparison students from each of four successive graduating classes be sampled. This number is the desired size of one year's comparison sample at the end of four years; in light of the expected higher attrition rates from these groups, it is suggested that the first year's sample be 50% larger than this. Sample sizes of subsequent graduating classes may be adjusted as indicated by the observed attrition rate from the first class.

The number of preceptees from each graduating class to be sampled

over four years should be 750; this is roughly one fourth of all students taking preceptorships each year. Of this 750, one half will be from required preceptorship programs, one fourth from schools with optional programs, and the remaining one fourth will come from open preceptorship programs not sponsored by medical schools (such as those administered by the AMSA Foundation). In the event that this latter group of programs are not funded by the time this study is initiated, the preceptorship sample should be split between required and optional schools. Should legislation be passed requiring schools to conduct preceptorship programs, then obviously the sample groups described here will not be available. It would still be possible to do a similar study, but some effort would have to be made to identify those students, who, prior to taking preceptorships, would have chosen not to enter such programs if they had had a choice. This latter strategy would still enable one to determine the effects of preceptorship experiences on subsequent career choices.

3. Sample Rationale: Procedure

Since we are interested in observing, among other things, the effects of opportunity structures regarding preceptorship experiences, it is not feasible to sample individual students in the first stage. The sampling frame required for this kind of sample would be extremely expensive to prepare and very inefficient in generating the kind of observations we need to obtain for our study. The most efficient way to obtain the necessary observations of preceptorship opportunity structures is to sample schools which have the kinds of preceptorship opportunities we wish to observe. In addition, there are at least two other criteria which should be employed in selecting the sample of schools:

geographic location and institutional factors. These variables reside in the schools rather than in the students, and hence in order to obtain an adequate range of variation on these factors, these criteria must be applied to our procedure for selecting schools.

Without specifying in detail the actual sample to be drawn, it is possible to suggest how these criteria should be used. Use of a typology of medical schools such as that presented by Otis et al. (3) should be the first step, with an attempt made to obtain schools from each type. Geographic region might be used in the next step, with an attempt being made to meet both criteria; an adequate range of both school types and geographic regions. Finally, the criterion of type of preceptorship program should be applied. Since this is the most important of the criteria, schools should be selected so as to secure the pattern of observations and numbers of students described in sections 1 and 2 above, even if this means that the first two criteria need to be relaxed somewhat. Once the schools have been selected, it would be most efficient in terms of cost, time and personnel to sample all the juniors and seniors at the selected schools.

Obviously the above sample would not be a random sample of all students in U.S. medical schools. Rather, it is a sample designed for specific purposes. If we only wanted to generate data descriptive of the population of medical students in this country, some kind of random or stratified sample would be best. This is not our primary purpose, however. Since the primary purpose is to evaluate the effects of preceptorship experiences, we need above all to obtain the pattern of observations which will generate data adequate for this purpose. In other words, given constraints of cost and time, we wish to obtain data which are

representative of the effects of various preceptorship opportunities. The necessary data may or may not be representative of all medical students in the country, but even if they are not, the sample will answer our primary questions and still yeild considerable data about a fairly large proportion of medical students in the country.

4. Pre-clinical Preceptorship Sample

Given the sampling considerations just mentioned, very little additional design specifications are necessary for evaluating the effects of pre-clinical preceptorship experiences. Once the schools have been selected for the evaluation of clinical preceptorships, we need only to incorporate into our system the freshmen and sophomores from the same schools as the juniors and seniors already in our system. In terms of the over-all tracking design, this results in only two minor differences. (1) The first year of data collection will involve approximately twice as many students as are indicated in Table 6. However, this is only for the first year of data collection; instead of picking up the additional students when they are juniors or seniors, they enter the system as freshmen or sophomores. The total number of students remains the same. The only difference is that during the initial year, all four classes in the selected schools enter the system rather than just the juniors and seniors. (2) The data collection schedule for those who enter the system as freshmen or sophomores will be slightly different from those who enter the first year as upper classmen. The rather large battery of instruments to be administered can be spread out over a longer time span for those students who will enter the system earlier than others. An example of what the data collection schedule would look

like for a student entering the system as a freshman appears in Figure 1; this may be contrasted with the schedule appearing in Table 7 for those entering the system as juniors or seniors.

IV. ALTERNATIVE SYSTEMS

A. Other Longitudinal Systems

The system described above represents the most comprehensive longitudinal study system for studying effects of preceptorship experiences on career preferences. Less comprehensive systems could be employed. In the main, such systems would be reduced versions of the one described above; remaining alternatives would depart from the longitudinal approach altogether. We will first consider other longitudinal systems.

1. Reduced Comparison and Preceptee Groups

One alternative scheme would involve ignoring the distinction among preceptorship opportunities and among the comparison groups described above. In the extreme case, the study would simply compare students who did not take preceptorships with those who did; there would be no effort made either (a) to distinguish between students whose schools offered preceptorships and those whose schools do not (the two comparison groups), or (b) to distinguish among students who took required, optional, or open preceptorships (the preceptee groups).

The advantages of this scheme would be several. First of all, it would be easier to select the sample since one of the criteria would no longer be applicable; schools would be selected simply on the basis of geographic region and institutional variables. Second, the sample sizes could be reduced, particularly for the preceptee group, since there would be no need to obtain some minimum number of students having specific preceptorship opportunities. Third the complexity of the data base system would be decreased since there would only be two groups to distinguish. Fourth, the cost of setting up and operating the system would be less.

The disadvantages of the system include the fact that it would not be possible to determine the effects of different preceptorship opportunity structures on career preferences. More specifically, we could not determine the effects of required preceptorship programs on career preferences. These disadvantages are significant, particularly in view of some recent proposals which would require medical schools to offer preceptorship programs.

2. Reduced Variables

Another alternative would be to leave the sample groups the same as in the comprehensive system, but to reduce the categories of variables to be included in the assessments. The scheme here is not simply a reduction in the number of variables measured, but rather the complete elimination of entire categories of variables. We might, for example, decide to eliminate the assessment of clerkship experiences and/or of attitudes.

The advantages of such an approach would primarily be in the realm of costs, but even here the savings would not be particularly significant. Supplies for some questionnaire forms could be eliminated, as well as the costs involved in keypunching the data and storing it. Space in the data base file would be reduced. These savings are not significant, however, because the costs of selecting the sample, of contact personnel administering the questionnaires at each medical school, and of maintaining a data base structure would be the same regardless of the elimination of, say, two of the instruments.

The disadvantages of such a system considerably outweigh the advantages. By eliminating some categories of variables, in effect we are relinquishing control over some of the factors which have been shown

to be related to career preferences. This lack of control would mean that when it comes to interpreting the final results, we could not be certain that the uncontrolled variables were not responsible for some of the effects observed. If preceptee groups, for example, showed a greater inclination to enter primary care niches, we could not be certain that the peculiar nature of their clerkship experiences or their different attitudes were not the causes of the differences rather than their preceptorship experiences.

3. Reduced Sample Size

It would also be possible to reduce the sample size while maintaining the same sample groups and assessing the same categories of variables. This could be accomplished by reducing the number of schools drawn in the sample. (We could also keep the number of schools the same and simply reduce the number of subjects by testing only some of the students at each school rather than all, but this would result in extremely minimal cost savings).

The advantages of this would be that personnel costs would be reduced (fewer contact persons would have to be paid), storage requirements for the data would be reduced (although not the complexity of the file structure), and the materials and supply budget would be reduced. There would also be some savings in terms of travel to establish and maintain contacts with medical schools since there would be fewer schools from which data were being collected.

The disadvantages would be of two main types. First of all, the range of variation with respect to geographic region and institutional variables would be smaller. It might even be that some geographic regions or some institutional variables would not be included at all. So long as the

regions or variables excluded from the system were not important in explaining career dispositions, nothing would be lost; but there would be no way of being certain that this was indeed the case. Second, the n's for each sample group would be smaller, meaning that (a) the reliabilities of some statistics we might wish to apply to the data would be reduced, and (b) there might be some instances in which we simply did not have enough subjects to perform an analysis using certain combinations of sample categories and variables (e.g., female students taking required preceptorships).

4. Reduced Time Span for Tracking

Another alternative would involve looking only at clinical preceptorships and eliminating observation, testing, and tracking of students during their first two years of school. This would, of course, eliminate being able to look at the effects of theseearly preceptorship experiences in any detail. At best we would merely be able to ascertain whether or not a student had had such an experience and perhaps obtain some retrospective data on his memory of the experience. The rationale for this alternative would have to be that we would be less interested in examining closely the effects of these early preceptorships or that we would assume that they are not important enough in their effects to assess them in our study. This latter assumption may rest on rather shaky grounds.

Other variations in longitudinal study systems could be developed using combinations of the strategies mentioned above, but they will not be mentioned here except to note that the disadvantages would not necessarily be additive but rather multiplicative. For example, were we to reduce the number of sample groups and the number of variables, the loss in control over factors which could influence career dispositions

could be great enough to make the study devoid of substantive import or sound results on which policy decisions could be based.

A costing out of the above alternative systems has not been made in this report for several reasons. The cost differentials between the comprehensive system and the reduced systems is not great, and the loss of essential information is considerable. The greatest costs in any of the systems discussed above is the capital investment involved in setting up the data base systems and tracking mechanisms. The second greatest cost occurs in the analysis of the data and the outputting of reports. These costs would be nearly the same for all of the above systems.

By way of a general assessment of these longitudinal systems, we can simply say that in research, as in business, one gets what one pays for; however, careful "shopping" is also of value. The quality of data, information and results obtainable with the comprehensive system appear to be considerably greater than the possible costs differences between it and any of the other reduced systems.

B. Non-longitudinal Alternatives

There are several other types of studies which could also yield useful but limited information concerning the effects of preceptorship experiences on career paths. The data collection schedule for one such study is shown in Table 1. This study incorporates the same sample design as was described for the longitudinal tracking system, i.e., it distinguishes five sample groups which are to be selected according to the same criteria used in the longitudinal design. The sample size could be varied according to cost constraints or other criteria, but should include enough students to provide the "n" needed for multivariate analyses (in this case, something on the order of 1500 from each graduating class).

TABLE 1

Data Collection Schedule for ONE Non-Longitudinal Study

Sample Groups	← Year N → Specified Times of Data Collection →		← Year N + 1 →
	September	Pre Experience / Post Experience	September
I. Comparisons			
A. C-Optional N+1 (Yr of grad)[1]	BMACL I CR		G
B. C-None N+1[2]	BMACL I CR		G
II. Preceptees			
A. Required N+1[3]		BMACL I CR / Pe PR CR	G
B. Optional N+1[4]		BMACL I CR / Pe PR CR	G
C. Open N+1[5]		BMACL I CR / Pe PR CR	G
I. Comparisons			
A. C-Optional N+2		BMA I CR	A CL CR
B. C-None N+2		BMA I CR	A CL CR
II. Preceptees			
A. Required N+2		BMA I CR / Pe PR CR	A CL CR

TABLE 1 (Con't)

Sample Groups	← Year N — September	Specified Times of Data Collection → Pre Experience	Post Experience	← Year N+1 → September
B. Optional N+2		BMA I CR	Pe PR CR	A CL CR
C. Open N+2		BMA I CR	Pe PR CR	A CL CR

KEY:

INSTRUMENT	ASSESSMENT OF:
B	Biographical Data
M	Myers-Briggs Type Indicator (Personality)
A	Attitudes
CL	Clerkship Experience
I	Institutional Characteristics
CR	Career Dispositions
Pe	Preceptee Rating of Preceptorship Experience
PR	Preceptor Ratings of Preceptee
G	Residency Choice and Career Dispositions

FOOTNOTES

1. Students attending schools with optional preceptorships and having not elected to take such.
2. Students attending schools with no preceptorships available.
3. Students attending schools which require preceptorships.
4. Students attending schools with optional preceptorships who have elected to take such.
5. Students who elect to take independent preceptorships at places such as AMSA Foundation.

Data collection extends over a 15 to 18 month period. In this time frame, it is possible to observe what residencies the seniors choose. Presumably this would be a good indication of the direction of their career paths, although it should be pointed out that many students change residencies. For those who are initially assessed as juniors, it is possible to observe their career preferences at the beginning of their senior year. Using extrapolations from the preceeding class, it may be possible to estimate what proportions of these juniors will enter various residencies.

If we can assume that career preferences expressed at the beginning of the senior year and of residency are accurate indications of future career paths, this study provides us with an assessment of at least the short term effects of preceptorship experiences. However, this assumption is not as solid as one might wish. Data from the longitudinal study at New Mexico indicates that many seniors indicate a preference for family practice in shortage or rural areas. Their preferences decline over their post-graduate training, however, and in fact many of them express almost equally strong preferences for other career paths as well. In other words, previous studies suggest that senior preferences cannot be reliably used as indicators of ultimate career paths.

What this means is that the short term effects of preceptorships may not parallel the longer term effects, and the findings from a study such as that in Table 1 may not accurately reveal what effects clinical preceptorships have in terms of actually getting more physicians to enter practice in shortage areas.

Other variations derivable from this non-longitudinal design are possible -- not an infinite number, but certainly many more than can be discussed here. Some of these variations might involve reducing the number of variables, changing the number of sample groups, shortening the time span of the study, e.g., looking only at changes during the preceptorship itself rather than at changes occuring

over a year and a half, and simply doing a before-and-after study without a comparison group at all. All of these variations suffer from the limitations of the design described above and in addition lack in varying degrees the kind of controls that would be necessary to separate the effects of various factors influencing career dispositions, including preceptorship experience. While these kinds of studies would undoubtedly be cheaper, they would also yield less certain and less useful knowledge. It bears repeating that one gets what one pays for.

Of these non-longitudinal designs, only the one described in Table 1 will be given cost estimates. Taking into account time for sample selection and instrument development, the study would cover two and one-half years. Costs are shown in Table 2.

Table 2

Estimated Costs of Non-Longitudinal Study Described in Table 1

	Year 1	Year 2	Year 3 (6 mo)	Subtotals
I. Staff Salaries				
A. Project Director[1] (100% time)	$25,000.	$27,000.	$14,580.	$ 66,580.
B. Associate Director[2] (100% time)	$21,000.	$22,680.	$12,245.	$ 55,925.
C. Research Assistant[3] (75% yr. 1; 50% yr. 2)	$ 6,750.	$ 4,860.	-------	$ 11,610.
D. Programmer[4] (25% time yr. 2)	-------	$ 4,000.	-------	$ 4,000.
E. Secretary (100% time)	$ 7,800.	$ 8,424.	$ 4,550.	$ 20,774.
F. Fringe Benefits (15% of salaries)	$ 9,085.	$10,045.	$ 4,706.	$ 23,836.
Subtotals	$69,635.	$77,009.	$36,081.	$182,725.

Table 2

Estimated Costs of Non-Longitudinal Study Described in Table 1 --- (cont'd.)

	Year 1	Year 2	Year 3 (6 mo)	Subtotals
II. Communications				
A. Postage [5]	$ 1,000.	$ 1,000.	$ 200.	$ 2,200.
B. Printing [6]	$ 5,000.	$ 1,000.	$ 800.	$ 6,800.
C. Telephone [7]	$ 2,000.	$ 2,000.	$ 1,000.	$ 5,000.
D. Materials & Supplies	$ 2,500.	$ 2,500.	$ 1,500.	$ 6,500.
E. MBTI Questionnaire [8]	$ 1,500.	------	------	$ 1,500.
F. MBTI Scoring [9]	$ 6,000.	------	------	$ 6,000.
Subtotals	$18,000.	$ 6,500.	$ 3,500.	$28,000.
III. Computer Operations				
A. CPU Time [10]	------	$ 5,000.	$ 3,000.	$ 8,000.
B. Keypunching [11]	$ 3,000.	$ 1,500.	------	$ 4,500.
C. Cards, Tapes, Misc.	------	$ 250.	$ 100.	$ 350.
Subtotals	$ 3,000.	$ 6,750.	$ 3,100.	$12,850.

Table 2

Estimated Costs of Non-Longitudinal Study Described in Table 1 --- (cont'd)

	Year 1	Year 2	Year 3 (6 mo)	Subtotals
IV. Auxiliary Personnel[12]				
A. Contacts at Preceptorship Schools	$3,650.	$3,650.	-------	$7,300.
B. Contacts at Non-Preceptorship Schools	$ 600.	$ 600.	-------	$1,200.
Subtotals	$4,250.	$4,250.	------	$8,500.
V. Travel[13]	$7,000.	-----	------	$7,000.
Yearly Direct Cost Totals	$101,885.	$94,509.	$42,681.	--------
Grand Total Direct Cost				$239,075.

FOOTNOTES FOR TABLE 2

1. The Project Director is assumed to be a Ph.D. behavioral scientist with considerable background and experience in medical education research and specifically in the career development of physicians.

2. The Associate Director is also assumed to be a Ph.D. behavioral scientist with expertise in research methodology and perhaps some experience in medical education research.

3. The Research Assistant preferrably should have a B.A. in one of the behavioral sciences and some background in research methodology and statistics.

4. The Programmer should have a degree in computing science, experience in using canned statistical packages such as SPSS, and experience in developing data base files.

5. The estimate for postage is based on the need for correspondence with medical schools contacted for purposes of participating in the study and for mailing instruments between project's headquarters and the participating schools. Postage for the third year covers only general office correspondence and mailing of reports to funding agencies.

6. Printing is for instruments (estimated as equivalent to eight 4-page forms @$500/form) and for form letters to students describing the nature and purposes of the study. The figure for the third year covers costs of duplicating reports delivered to funding agency.

7. Telephone usage is not estimated to be sufficient to justify a WATS line, but some calling will have to be done between project headquarters and participating schools.

8. Based on a price of $.50 per questionnaire and answer sheet set; computed for an estimated 3000 students.

9. Based on a rate of $2/case for scoring at the Center for Applications of Psychological Type (CAPT).

10. Based on rates for outside users at the University of New Mexico Computing Center; rates at other installations may vary.

11. Keypunching figures are based on an estimated 12 cards per preceptee, 1500 preceptees, @$.15/card; an estimated 6 cards per non-preceptees, 1500 non-preceptees, @$.15/card; and some miscellaneous punching of computer programs.

FOOTNOTES FOR TABLE 2 (Con't)

12. Auxiliary personnel are needed at each medical school to administer instruments to students, to send completed questionnaires back to project headquarters, and to answer students' questions regarding the project. Contact persons at schools having preceptorship opportunities must administer instruments to preceptees throughout the year; and estimated 1/8 secretary/school during the 15 months of data collection is needed for this task. For non-preceptorship schools, an estimated 80 hours is needed for the 15 month period. Figures are based on a rate of $3.75/hour. Figures for the total effort of auxiliary personnel are divided evenly between the first two years ans assume 6 preceptorship schools and 4 non-preceptorship schools.

13. Travel is for the purpose of contacting schools to obtain their cooperation and participation in the study and for orientation sessions for auxiliary personnel estimated on the basis of 1 trips/school to 10 schools @$350/trip for one season.

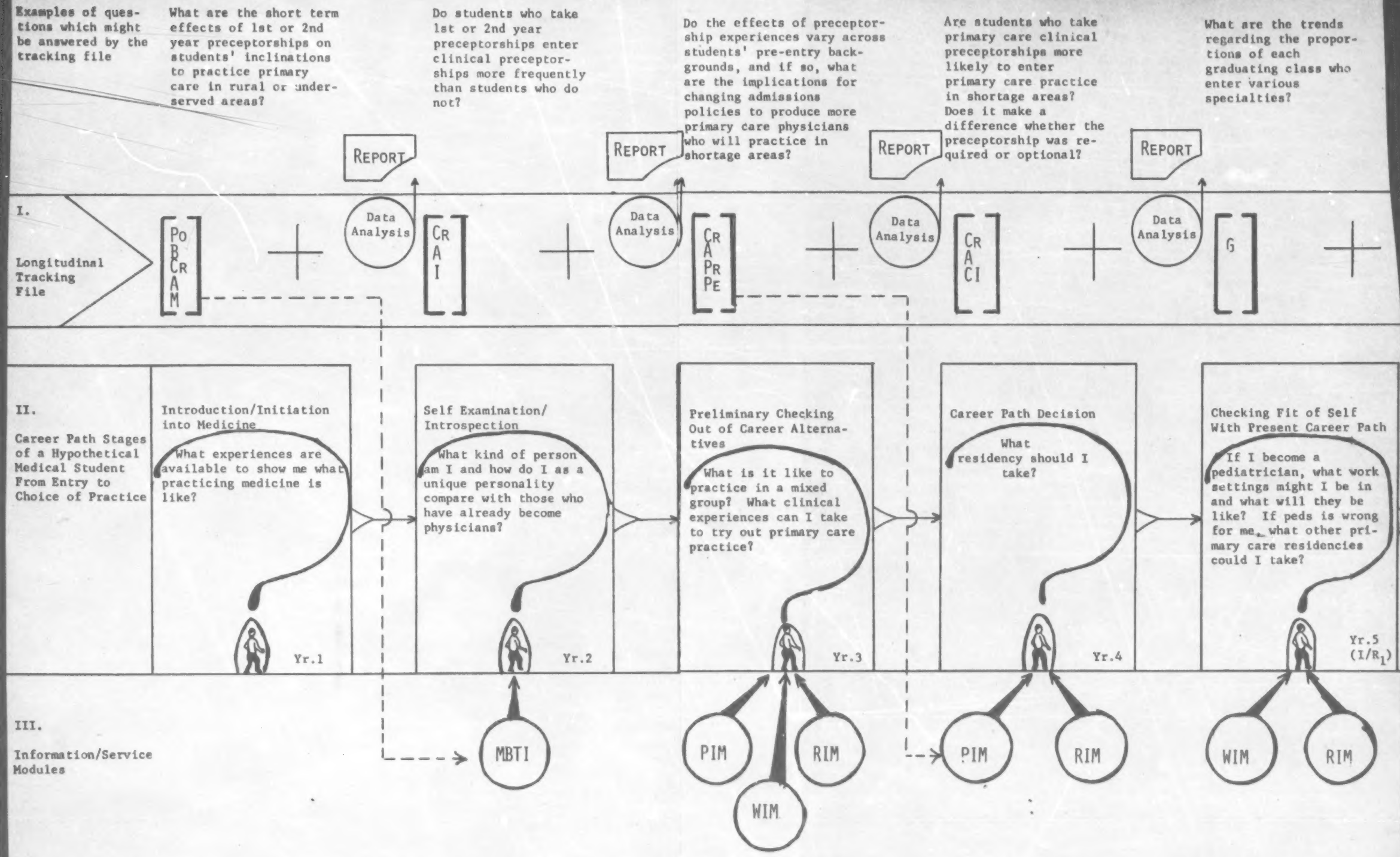
V. DESCRIPTION OF THE SYSTEM

A. Introduction and Overview

The entire system proposed here is illustrated in Figure 1 for a hypothetical student. The yellow blocks depict the student at each year of his training and describe some hypothetical questions he might be asking himself at each stage of his career development. These stages and questions are hypothetical with respect to the times at which they appear. Obviously different students may ask themselves these questions at different times, and the same student may ask himself some questions at more than one time; however, these stages and questions are typical of a medical student's career development process in general.

The tracking file depicted in Figure 1 shows the data collection schedule for a student who enters the system as a freshman and takes a pre-clinical preceptorship during his first year and a clinical preceptorship during his junior year. The data collection schedules would be slightly different for students who took their preceptorships at other times, or who did not take any preceptorships at all.

The lower part of the figure shows the information/service modules which provide students with information about themselves, possible training experiences open to them at various career stages, information about the characteristics of different practice niches, and finally, information about communities needing physicians. It should be emphasized that in actual operation, these service modules may be available to the student at any time, although specific modules are likely


Examples of questions which might be answered by the tracking file
What are the short term effects of 1st or 2nd year preceptorships on students' inclinations to practice primary care in rural or underserved areas?
Do students who take 1st or 2nd year preceptorships enter clinical preceptorships more frequently than students who do not?
Do the effects of preceptorship experiences vary across students' pre-entry backgrounds, and if so, what are the implications for changing admissions policies to produce more primary care physicians who will practice in shortage areas?
Are students who take primary care clinical preceptorships more likely to enter primary care practice in shortage areas? Does it make a difference whether the preceptorship was required or optional?
What are the trends regarding the proportions of each graduating class who enter various specialties?
REPORT
REPORT
REPORT
REPORT
I.
Longitudinal Tracking File
Po B Cr A M
Data Analysis
Cr A I
Data Analysis
Cr A Pr Pe
Data Analysis
Cr A CI
Data Analysis
G
II.
Career Path Stages of a Hypothetical Medical Student From Entry to Choice of Practice
Introduction/Initiation into Medicine
What experiences are available to show me what practicing medicine is like?
Yr.1
Self Examination/ Introspection
What kind of person am I and how do I as a unique personality compare with those who have already become physicians?
Yr.2
Preliminary Checking Out of Career Alternatives
What is it like to practice in a mixed group? What clinical experiences can I take to try out primary care practice?
Yr.3
Career Path Decision
What residency should I take?
Yr.4
Checking Fit of Self With Present Career Path
If I become a pediatrician, what work settings might I be in and what will they be like? If peds is wrong for me, what other primary care residencies could I take?
Yr.5 (I/R1)
III.
Information/Service Modules
MBTI
PIM
RIM
WIM
PIM
RIM
WIM
RIM

I. A computerized file of data to be collected on approximately 9000 medical students from their entry as freshmen to completion of residency. Letters in brackets refer to instruments. Actual sequence of data collection for each student may vary from the hypothetical case shown here. Dotted lines from tracking file to service modules indicate data entered in service modules.

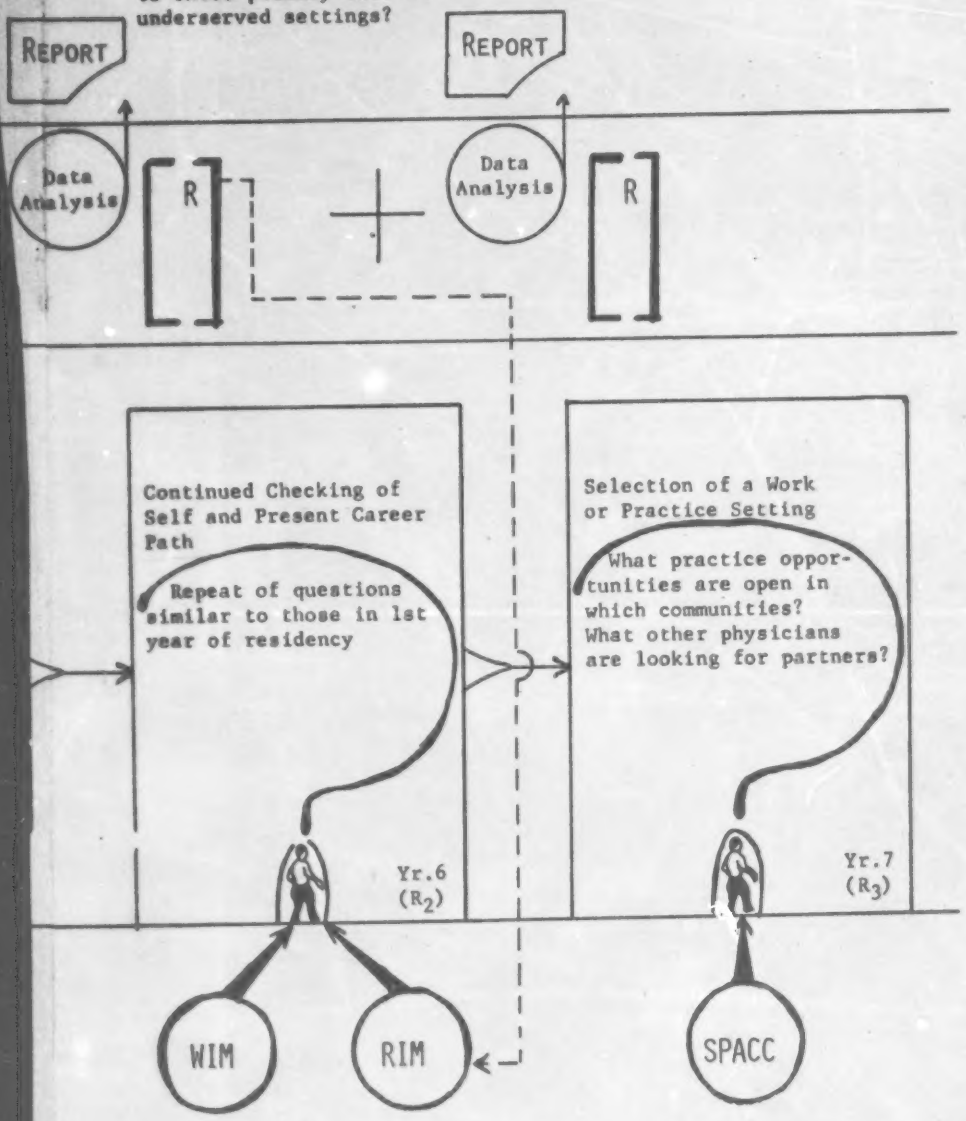
Instrument	Assessment of:
Po	1st or 2nd yr. clerkship
B	biographical data
Cr	preferences of specialty, work setting, geo. area, etc.
A	attitudes
M	Myers-Briggs Type Indicator (personality)
I	institutional characteristics
Pe	preceptee ratings of clinical preceptorship experience
Pr	preceptor ratings of preceptee
Cl	clerkship experiences
G	residency choice info. & career preferences
R	ratings of residency experience and career choice info.

II. Stages of career exploration and decision making. Timing of stages & questions may vary with individuals. Questions listed are examples of the kinds of questions students may ask at each stage. R_1, R_2, R_3 refer to years of residency.

III. The PIM, RIM, & WIM modules may be used at any time a student wishes to access them. Their availability is not limited to those times indicated in the figure.

KEY: MBTI, PIM, RIM, WIM, SPACC

FIGURE 1


What kinds of preceptorship experiences are most likely to result in long-term, positive increases in students' dispositions to enter primary care in underserved settings?
REPORT
REPORT
Data Analysis
R
Data Analysis
R
Continued Checking of Self and Present Career Path
Repeat of questions similar to those in 1st year of residency
Selection of a Work or Practice Setting
What practice opportunities are open in which communities? What other physicians are looking for partners?
Yr.6 (R_2)
Yr.7 (R_3)
WIM
RIM
SPACC

- personal feedback concerning individual's personality preferences.
- Preceptorship Information Module: a computerized file of clinical preceptorships from which a student or program may obtain a listing of those programs or students meeting his/its selection criteria.
- Residency Information Module: similar to PIM except file contains primary care residencies.
- Work Setting Information Module: a file containing descriptions of the characteristics of various specialty and work setting combinations with which the student may interact to obtain information about career "niches" which he may be considering.

System for Physician & Community Contact: a computerized file of communities seeking physicians and physicians seeking practices or partners. It permits any entry in the file to obtain a list of communities, partners or physicians which match its selection criteria.

to be more relevant to his career choices at some times than at others. The service modules have two main functions: (a) to provide the student with information about training experiences and career path alternatives which are open to him at various stages of his career development and of which he might not otherwise be aware; and (b) to provide students with incentives to remain in the tracking system. Students' overwhelming agreement on the need for such information suggests that this latter function would be much more effective than other types of incentives (see Appendix B).

The relationships of the various modules to the goals discussed in Section I are shown in Table 3. The MBTI is an integral part of the research effort in evaluating effects of the preceptorship experience and is thus depicted as serving the same functions as the data file of the tracking system (CREAM). However, it is also shown in Figure 1 as being a service/information module, and this is because the feedback which can be given to students about their personality preferences is seen as being a source of valuable insight to students regarding how they compare to other students and physicians in terms of personal characteristics. It does not have any direct contribution to the other goals shown in Table 3. Nevertheless, it contributes to the system as a whole by providing students with feedback and thus is an early incentive to remain with the system; the other modules are valuable as incentives primarily to students who have reached their junior year or beyond.

It should be emphasized that the system depicted in Figure 1 is comprised of complementary parts which are coordinated with each other to produce a unified comprehensive system serving the several goals mentioned

TABLE 3

Goals Served by System Modules

GOALS	Modules					
	Comprehensive Research, Evaluation and Assessment Module (CREAM)	Myers-Briggs Type Indicator (MBTI)	Preceptorship Information Module (PIM)	Residency Information Module (RIM)	Work Setting Information Module (WIM)	System For Physician and Community Contact (SPACC)
1. To evaluate the long-range effects of preceptorship programs on physician career development.	X	X				
2. To generate data representative of trends in physician career dispositions.	X	X				
3. To generate data regarding (a) how career decisions are made, and (b) the "causes" of career dispositions and choices.	X	X				
4. To facilitate career decision-making and the placement of physicians in underserved settings by providing information service systems to medical students, physicians in training and in practice, and communities seeking physicians.			X	X	X	X

in Section I. The maximum benefit of the system accrues when the system is operated as a whole; yet its components can operate alone and each offers something of value in and of itself.

Description of the system will begin with the Comprehensive Research, Evaluation, and Assessment Module (CREAM), following which each of the smaller components will be described.

B. Comprehensive Research, Evaluation and Assessment Module (CREAM)

This module may be described as a group of several computerized files on which are stored data collected from the sample of medical students specified in the research design described in Section III. The main function of this module is the maintenance of a data base on the sample of students included in this proposed study design. The uses of this data base are many, but primarily consist of the generation of descriptive and analytical reports needed for the policy and funding decisions of various private and public institutions. It can also serve as a source of names of physicians (subject to privacy constraints) for the recruitment efforts of agencies such as the NHSC.

Before considering the computer operations of this module, it is necessary to examine the data which will be input to it. Table 4 shows the instruments needed for the entire system proposed here, the approximate numbers of variables in each instrument, and the modules in which each instrument will be used. Table 5 shows the number of juniors and seniors who will enter the system each year. If the entire system includes freshmen and sophomores, as described in Figure 1, the number of students entering the system in the first year will be approximately double the total number of students shown in Table 5. These freshmen and sophomores will be from the same schools as the juniors and seniors of the first year, so the numbers in Table 5 for years n+1 through n+3 will remain the same.

Table 6 illustrates the numbers of students in each sample group who will be at various stages in their post-graduate careers by the

TABLE 4

Instruments Needed for Entire System and Associated Modules

Instruments	Estimated Number of Variables	Module
A. Existing		
1. Biographical	16	CREAM
2. MBTI	25	CREAM
3. Preceptee	184	CREAM
4. Preceptor	57	CREAM
5. Career Preference	140	CREAM
B. To Be Developed		
1. Attitude	50	CREAM
2. Clerkship	50	CREAM
3. Institutional	35	CREAM
4. Graduate	50	CREAM
5. Residency	70	CREAM
6. Practice Questionnaire	70	CREAM
7. Preceptorship Site Info.	35	PIM
8. Preceptorship Prog. Info.	25	PIM
9. Preceptee Ratings of Experience	50	PIM
10. Residency Program Info.	70	RIM
11. Resident Ratings of Experience	50	RIM
12. Work Setting Questionnaire	180	WIM
13. Community Information	50	SPACC
14. Physician Preference Info.	50	SPACC

CREAM = Comprehensive Research, Evaluation and Assessment Module

PIM = Preceptorship Information Module

RIM = Residency Information Module

WIM = Work Setting Information Module

SPACC = System for Physician and Community Contact

TABLE 5

Numbers of Students in Each Sample Group
Entering the System Each Year

	Year n	Year n+1	Year n+2	Year n+3
I. Comparisons*				
A. C-Optional				
Seniors	750	750	750	750
Juniors	750	750	750	750
B. C-None				
Seniors	750	750	750	750
Juniors	750	750	750	750
II. Preceptees**				
A. Required				
Seniors	380	190	190	190
Juniors	190	190	190	190
B. Optional				
Seniors	200	100	100	100
Juniors	100	100	100	100
C. Open				
Seniors	200	100	100	100
Juniors	100	100	100	100

*Groups connected by arrows are comprised of the same individuals (who entered the system as juniors and remain in it as seniors).

**Each numerical entry refers to unique groups of individuals, i.e., either students who take their preceptorship as juniors or who take it as seniors.

beginning of the fifth year of the operation of the system. As Table 6 shows, compared to many longitudinal studies, the present system will obtain data on a sizeable number of students from preceptorship to choice of practice in a relatively short span of time.

Table 7 shows the data collection schedule for junior and senior students who have not entered the system as freshmen or sophomores. Double horizontal lines separate graduating classes; single solid horizontal lines separate comparison from preceptorship groups; dashed horizontal lines separate members of the same graduating classes who take preceptorships in their junior as opposed to their senior year; and single vertical lines separate years of data collection. Capital letters in parentheses correspond to service/information modules which are available to students at various times.

Implicit in Table 7 is the fact that some students in the sample may change groups. Students who enter the system in one of the comparison groups, for example, may later enter a preceptorship program, in which case they would move from the comparison group to one of the preceptee sample groups. This is a very real possibility for students attending schools which offer optional preceptorships, and may even occur at schools which do not offer any preceptorships if a student decides to seek such an experience at another school or through an independent preceptorship program. Such movement is of great interest both from a research and a practical point of view, but it necessitates using a special file and checking system in this CREAM module.

TABLE 6

Numbers of Students in Each Sample Group Who Will be at Various Stages of Their Careers by Fall of Year n+4

	Entering Practice	3rd Year Residents	2nd Year Residents	1st Year Residents	Senior Undergraduates
I. Comparisons					
A. C-Optional	750	750	750	750	375
B. C-None	750		750	750	375
II. Preceptees					
A. Required	380	375	375	375	190
B. Optional	200	200	200	200	100
C. Open	200	200	200	200	100

TABLE 7
DATA COLLECTION SCHEDULE FOR JUNIOR AND SENIOR STUDENTS WHO HAVE NOT ENTERED THE SYSTEM AS FRESHMEN OR SOPHOMORES

ple Groups / Comparisons	YEAR n Sept.	YEAR n Pre-Experience	YEAR n Post Experience	YEAR n+1 Sept.	YEAR n+1 Pre-Experience	YEAR n+1 Post Experience	YEAR n+2 Sept.	YEAR n+2 Pre-Experience	YEAR n+2 Post Experience	YEAR n+3 Sept.	YEAR n+3 Pre-Experience	YEAR n+3 Post Experience	YEAR n+4 Sept.
A. C-optional n+1	BMACI 1 Cr		(MBTI) (RIM)	G			R			(SPACC) R			P
B. C-none n+1	BMACI 1 Cr		(MBTI) (RIM)	G			R			(SPACC) R			P
Preceptees													
A. Required n+1		BMACI 1 Cr Pe Pr Cr	(MBTI) (RIM)	G			R			(SPACC) R			P
B. Optional n+1		BMACI 1 Cr Pe Pr Cr	(MBTI) (RIM)				R			(SPACC) R			P
C. Open n+1		BMACI 1 Cr Pe Pr Cr	(MBTI) (RIM)	G			R			(SPACC) R			P
Comparisons													
A. C-optional n+2	BMA 1 Cr		(MBTI)	A C1 Cr	(RIM)(WIM)		G			R			(SPACC) R
B. C-none n+2	BMA 1 Cr		(MBTI)	A C1 Cr	(RIM)(WIM)		G			R			(SPACC) R
Preceptees - taking as Jrs.													
A. Required n+2		BMA 1 Cr Pe Pr Cr	(MBTI)	A C1 Cr	(RIM)(WIM)		G			R			(SPACC) R
B. Optional n+2		BMA 1 Cr Pe Pr Cr	(MBTI)	A C1 Cr	(RIM)(WIM)		G			R			(SPACC) R
C. Open n+2		BMA 1 Cr Pe Pr Cr	(MBTI)	A C1 Cr	(RIM)(WIM)		G			R			(SPACC) R
Preceptees - taking as Srs.													
A. Required n+2					(RIM) (WIM)	BMACI 1 Cr Pe Pr Cr (MBTI)	G			R			(SPACC) R
B. Optional n+2					(RIM) (WIM)	BMACI 1 Cr Pe Pr Cr (MBTI)	G			R			(SPACC) R
C. Open n+2					(RIM) (WIM)	*BMACI 1 Cr Pe Pr Cr (MBTI)	G			R			(SPACC) R
I. **Comparisons**													
A. C-optional n+3			BMA 1 Cr (PIM) (WIM)			(MBTI)	AC1 Cr (RIM)			G			R
B. C-none n+3			BMA 1 Cr (PIM) (WIM)			(MBTI)	AC1 Cr (RIM)			G			R

II. Preceptees - taking as Jrs.										
A. Required n+3	(PIM)	(WIM)	BMA I Cr	Pe Pr Cr	(MBTI)		Cr (RIM)		G	R
B. Optional n+3	(PIM)	(WIM)	BMA I Cr	Pe Pr Cr	(MBTI)		ACl Cr (RIM)		G	R
C. Open n+3	(PIM)	**(WIM)	BMA I Cr	Pe Pr Cr	(MBTI)		ACl Cr (RIM)		G	R
II. Preceptees - taking as Srs.										
A. Required n+3	(PIM)	(WIM)					(RIM)	BMA Cl I Cr Pe Pr Cr (MBTI)	G	R
B. Optional n+3	(PIM)	(WIM)					(RIM)	BMA Cl I Cr Pe Pr Cr (MBTI)	G	R
C. Open n+3	(PIM)	**(WIM)					(RIM)*	BMA Cl I Cr Pe Pr Cr (MBTI)	G	R
I. Comparisons										
A. C-optional n+4			BMA I Cr				(MBTI)		ACl Cr (RIM)	G
B. C-none n+4			BMA	(PIM) (WIM)			(MBTI)		ACl Cr (RIM)	G
II. Preceptees - taking as Jrs.										
A. Required n+4						(PIM) (WIM)	BMA I Cr Pe Pr Cr	(MBTI)	ACl Cr (RIM)	G
B. Optional n+4						(PIM) (WIM)	BMA I Cr Pe Pr Cr	(MBTI)	ACl Cr (RIM)	G
C. Open n+4						**(PIM) (WIM)	BMA I Cr Pe Pr Cr	(MBTI)	ACl Cr (RIM)	G

*The RIM module will be made available to these students when they enter the system, which may or may not be September.

**These students will not be identifiable before they enter open preceptorships.

Key:
- B = Biographical Questionnaire
- MBTI = Myers-Briggs Type Indicator (personality)
- A = Attitude Questionnaire
- Cl = Clerkship
- I = Institutional Survey
- Cr = Career Preference Inventory
- Pe = Preceptee Questionnaire
- Pr = Preceptor Questionnaire
- R = Residency Questionnaire
- G = Graduate Questionnaire for 1st year residents
- P = Practice Questionnaire for physicians entering

Note: The numbers "n+1", "n+2", "n+3" and "n+4" under the various sample groups in the extreme left hand column indicate the year of graduation of the four classes shown in this table. Thus, the class labeled "n+1" begin their senior year in the fall of year n, they graduate in the spring of year n+1, and they enter residencies in September of year n+1.

Letters in parentheses indicate service modules which will be available to students. These modules are:
- MBTI = Myers-Briggs Type Indicator Feedback
- PIM = Preceptorship Information Module
- RIM = Residency Information Module
- WIM = Work Setting Information Module
- SPACC = System for Physician and Community Contact

Given this brief picture of the data and sample groups which will be differentiated, it is possible to set down some of the requirements of the module's computer files. The file containing data will be discussed first.

1. Data Base File. The data manipulation requirements for this file are shown in Table 8. With very large numbers of records or cases, (.e.g, 100,000 or more) it might be desirable to structure the data base in any of several ways; however, the present system will never contain that many cases, and a simple sequential storage structure should suffice. Complex data structures are a disadvantage when frequent re-arranging of the data is necessary, as would be the case with this system. Given the relatively small number of cases to be entered in the file and the expense involved in frequent re-structuring of complex storage systems, it appears that a sequential storage structure would be best.

   As shown in Table 8, however, it will be necessary to distinguish sample groups and individuals within them. This can be easily done by use of ID numbers which carry specified information such as year of graduation and a unique numerical identifier. Sample membership can be represented by a single variable which may take any of several coded values representing the various sample groups. If an individual changes his sample group membership, this can easily be entered in the file by changing the value of the corresponding variable. This procedure would be considerably simpler than having to change an entire sequence of pointers in a ring storage structure, for example.

TABLE 8

Data Manipulation Requirements for Data Base File

Data must be stored in such a manner that it is possible to:

1. Identify and access data in each of the five sample groups separately;
2. Store different amounts of data for each of the various sample groups;
3. Identify different graduating classes within each of the 5 sample groups;
4. Access each individual case;
5. Add data to each of the cases in the file;
6. Retrieve separate data elements from each case;
7. Retrieve any combination of data elements from any combination of sample groups and to input this data into existing statistical analysis packages, e.g., SPSS.

In its operation, the data base file is simply a data storage system into which new data is put from time to time and from which selected data is extracted from time to time for analyses. These operations are depicted in Figure 2. The numbered boxes in this figure correspond to the programs described in Table 9. These programs perform the necessary operations for (a) checking the incoming data for keypunching errors; (b) adding new data to the file and updating existing data if necessary; (c) extracting selected data from the file; and (d) sorting this extracted data into a form that will be appropriate for input to statistical packages.

These latter two programs are necessary for several reasons. First of all, data analysis will occur rather infrequently compared to the usage of some commercial data base systems. This means that we need not use the master file as input to statistical program, and consequently the master file need not be structured in the form needed for these programs (this would be difficult anyway, since the structures required and/or desired for input to these packages may vary considerably). Using the master file in this manner (i.e., simply as a source of data) leaves us free to store data sequentially on it, which in turn makes updating simpler.

Given sequential storage, however, the result is that when data is read off of the master file, the order in which it is thus obtained may not correspond to the structure needed for input to a statistical package. Consequently a program is required to order it as desired (program #4). Program #3 would be needed in any case since core and program limitations would require that some constraint be placed on the number of variables and/or cases being utilized in any given analysis.

2. Name and Address File. The requirements of keeping track of students during and after graduation and of identifying their changes in sample group membership suggests that a separate file would be appropriate for these purposes. The most efficient way to maintain such a file is to create separate subfiles for each graduating class. This is because (a) the data collection schedule will be different for various classes, depending on whether they entered the system as juniors or as freshmen; and (b) the times at which each class will have its sample group membership finally determined will be different for each class. Implicit in this line of reasoning are the facts that the file will be used to identify the instruments which should be administered to individuals in the system at various times and that it is inefficient and unnecessary to have to update (sort, merge, and add cases) an entire file when only a portion of the cases will be involved in the updating at any given time.

The procedures involved in the operation of one such subfile are shown in Figure 3. In this instance we are looking at the procedures applicable to students who enter open preceptorship programs which are not sponsored by medical schools. The same processes would apply to students who might enter any preceptorship programs being surveyed in this study, however.

The students who enter these open programs are compared with the list of students who are already in the system. Comparisons must be made against all sample groups. This is because it is possible (a) for students in either comparison group (i.e., who have not taken preceptorships) to enter open preceptorships, even if their own schools do not offer any preceptorship experiences; (b) for students who have already taken required preceptorships at their own schools to enter open programs; (c)

FIGURE 2

Typical Updating and Outputting Procedures for CREAM Data Base File

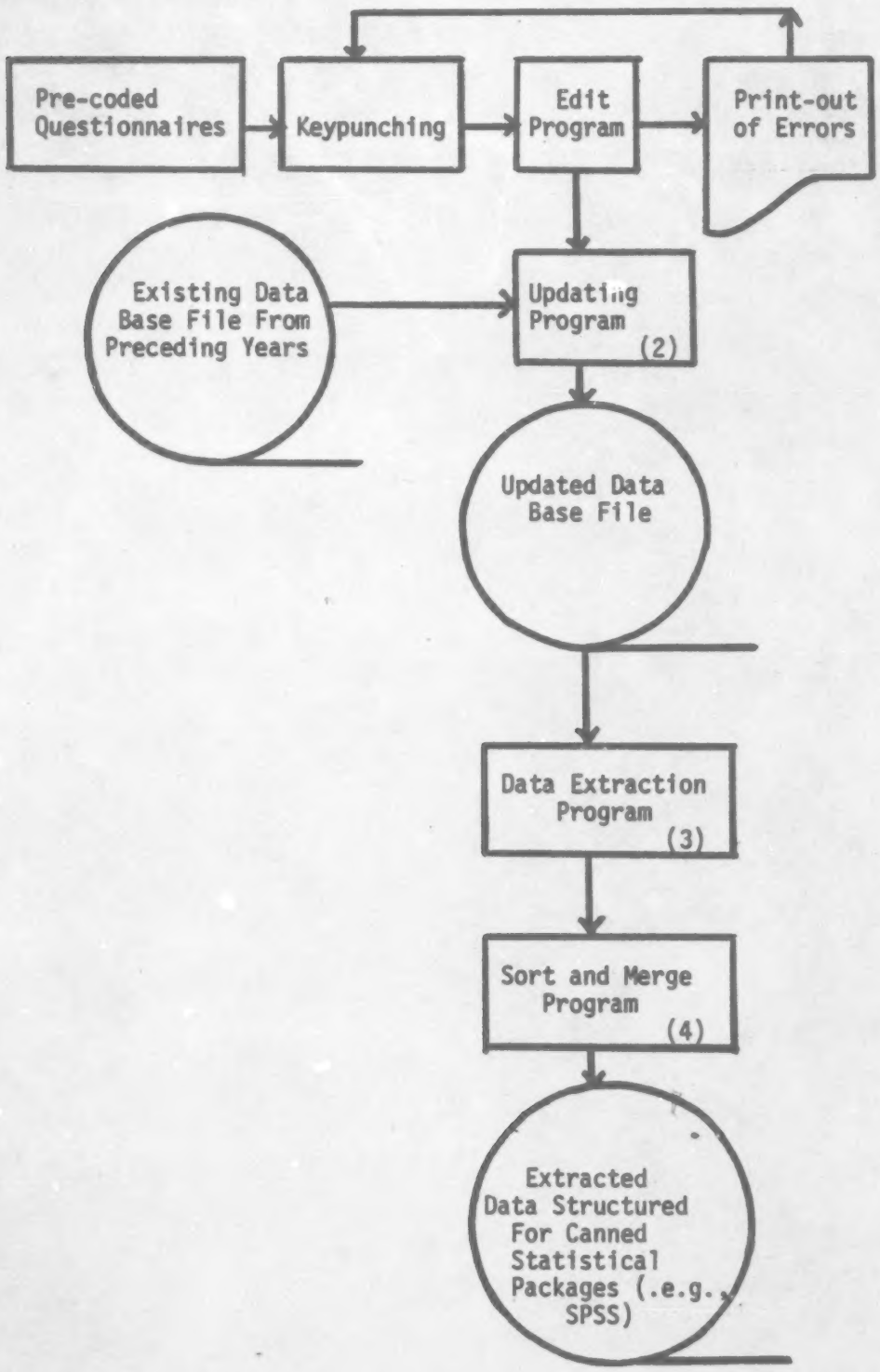

Pre-coded Questionnaires
Keypunching
Edit Program
Print-out of Errors
Existing Data Base File From Preceding Years
Updating Program (2)
Updated Data Base File
Data Extraction Program (3)
Sort and Merge Program (4)
Extracted Data Structured For Canned Statistical Packages (.e.g., SPSS)

TABLE 9

Programs Needed for the CREAM Module

Data Base File*

1. Edit Program. Inspects keypunched data being input to data base file and checks for correctness. The program checks for (a) alphabetic or numeric characters as required in each field; (b) values which lie outside the minimum and maximum values for each variable; (c) reasonable content of specified combinations of items, e.g., an individual who is 34 cannot have been in practice for 20 years. Prints out list of unacceptable data for visual check.

2. Updating Program. Adds data to individual records as the data are acquired; changes values of sample group membership variable as needed; adds cases to the file which have just entered the system.

3. Extraction Program. Selects specified variables from specified combinations of individuals or groups and outputs these on tape for input to the sort and merge program.

4. Sort & Merge Program. Reads the data input from the extraction program and orders it in the manner needed for inputting to packaged statistical programs. If the data are stored sequentially on the master file, the extraction program will write on tape those selected variables and individuals in the order in which they are stored on the master file. Statistical packages such as SPSS often permit analysis of subfiles, and if this is desired, the data being read into the package must already have the subfile structure desired. The sort and merge program's function is to pre-structure the data in the manner desired.

Name and Address File**

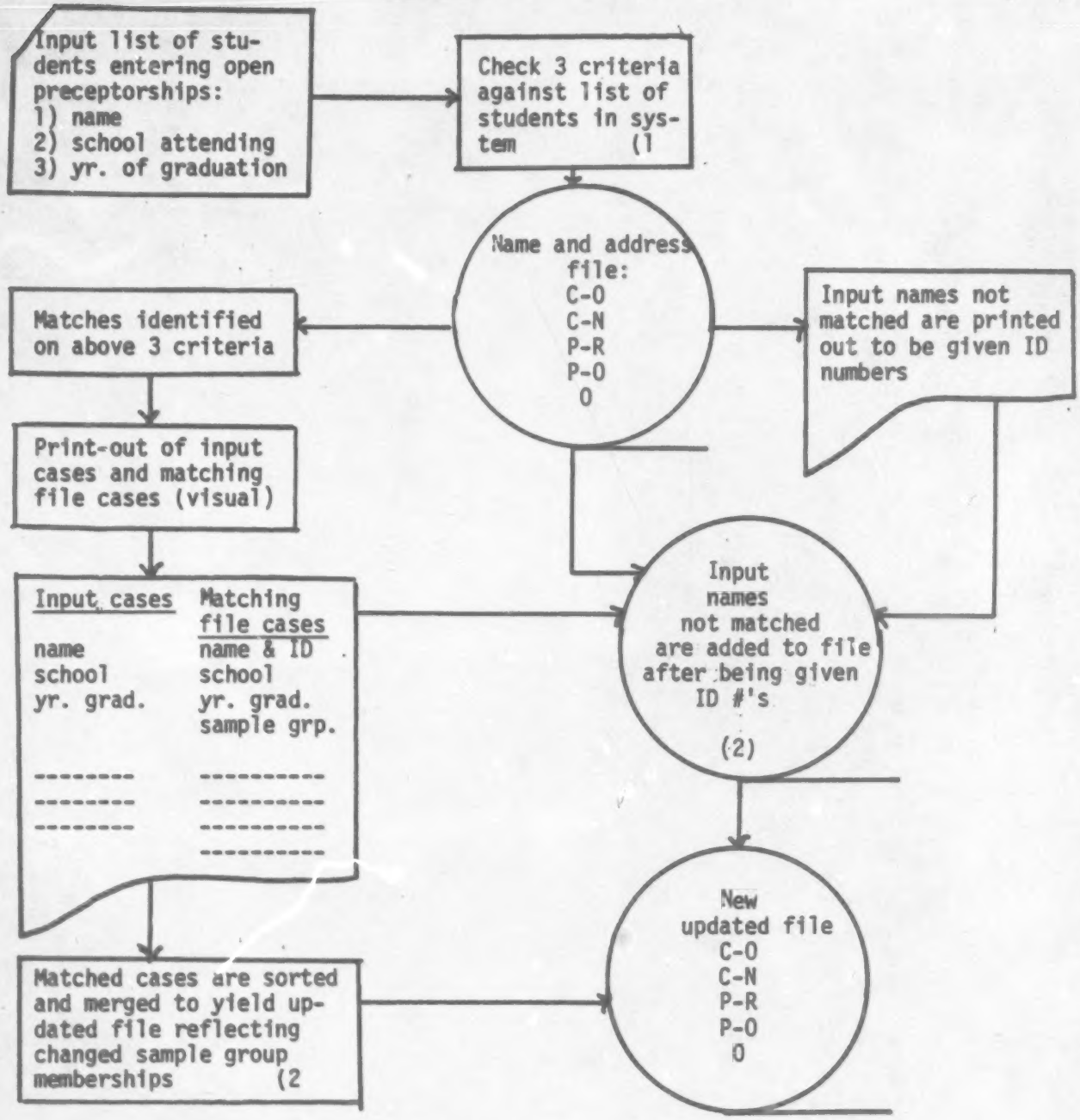
1. Name Check Program. Reads name and two criterion codes from the input deck and checks each of these against name and corresponding codes in the name and address file. Prints out those cases in which names and criteria matched for visual inspection. Prints out a separate list of those names which did not match so that they may be given identification numbers.

2. Update Program. Reads input cards containing cases matched in check program and revises sample group membership codes for these; reads name, criterion codes and other information for those cases which were not matched and adds these cases to the main name and address file.

*Numbers correspond to numbered boxes in Figure 2.
**Numbers correspond to numbered boxes in Figure 3.

FIGURE 3

Example of Operation of Name and Address File



KEY: C-O = school with optional preceptorshipl student not taking it
C-N = school with no preceptorship
P-R = school with required preceptorship
P-O = school with optional preceptorship; student is taking it
O = student entering independent preceptorship program

for students who have taken optional preceptorships at their own schools to enter open programs; and (d) for students who have already taken open preceptorships to take them again.

Three criteria are selected for checking to see whether students are already in one of the system's sample groups: last name and first letter of first name; school at which student is enrolled; and year of graduation. These criteria are suggested because they would be fairly easy to obtain quickly from those administering any type of preceptorship program. First letter of the first name is used because computers are quite inept at recognizing the similarity between Pat and Patricia or between Mike and Michael. A visual inspection of those cases in which all three criteria match a case already in the file is necessary to eliminate the uncertainties involved in relying on the computer to match first names and their variations.

The name and address file can also be used to determine what instruments need to be administered to given groups of students at any time. Since this file is divided into subfiles according to year of graduation, and since each subfile is structured by sample group membership, it is very easy to obtain a list of those students who are to receive specified batteries of questionnaires by using the file in conjunction with the data collection schedules in Figure 1 and Table 7.

While it has been referred to as the name and address file, this file will obviously contain other types of information as well. In addition to the kinds of data mentioned above, the file will include such things as students' confidentiality requests (see Section VII on confidentiality), ID numbers, and sample group membership codes. It could also contain

very limited numbers of variables whose values might require changing, e.g., marital status.

3. Potential Uses and Users. The extensive data gathered and put on file in this particular module comprises a data base which would be of significant value to several different kinds of users. Among these are preceptorship programs, governmental agencies such as the BHM and the BCHS, and numerous private institutions. In general, the data base would be valuable as a source of information on which to base funding and policy decisions seeking to effect changes in the career path choices of physicians presently in training, and consequently in the delivery of health care to underserved areas.

More specifically, the information to be contained in this module could be used to identify those promising points of funding and policy interventions in certain areas of the physician training process which would be most likely to result in more physicians entering practice niches which are presently going unfilled. There are many possible such "handles" or points of intervention which could be identified using the data base in this module; only a few of these will be discussed here as examples.

(a) Preceptorship Programs. The data to be collected here would permit identification of those specific characteristics of preceptorship experiences which increase student interest in such things as primary care practice, practicing in rural areas or small communities, or working with allied health personnel in a team approach. While available data indicate that preceptorship experiences do affect students'

career disposition, the data base proposed here would go beyond this state of knowledge and identify more precisely the specific program characteristics which spark students' interest in those career alternatives which are not presently adequately filled. Such information would seem to be directly relevant for funding decisions on the part of government agencies or foundations which are seeking guidelines for deciding which kinds of preceptorship programs to fund or for deciding how best to begin to deal with the physician maldistribution problem.

Such information would also be of considerable interest to the preceptorship programs participating in the system, and on a regular basis reports will beissued to those programs. These reports will provide participating programs with qualitative and quantitative comparisons of their own preceptorships with all others in the system. Qualitative comparisons will involve program content and emphases as well as mean ratings by students of their experiences. Quantitative feedback to programs will involve, for example, such data as the degree to which students' career dispositions change as a result of their experiences, comparison of changes by a program's own students to changes by students in other programs, and frequency distributions of student ratings of their experiences and of student career preference changes. These are only examples; other kinds of data may be included as desired by the various programs, and an effort will be made to determine program needs in this regard.

The value of such reports flows in two directions, both to the participating programs and to the operation of the entire system. Programs

will benefit from having data which may be used for evaluation of the effects of their own preceptorships on career dispositions of their students (the present system does not include data on acquisition of clinical skills or clinical competence). While some programs may already be undertaking evaluation projects of their own, not all of these are focused on career preferences. Those which do focus on this area will still benefit by being able to compare their own programs with those in other schools. The system will benefit by having an incentive to offer schools for participating in the system. If this data collection is sanctioned by Deans of the various schools, the response rates from each school will be considerably higher than they would be otherwise. In short, by offering schools some return for participating in this study the system should be able to obtain the cooperation that will be necessary to keep attrition rates from being excessively high (see Section VI, Incentives, for additional discussion of this point).

(b) Sequence of Training Experiences. The timing and sequencing of preceptorship experiences may be important in getting students interested in primary care practice in what are now underserved settings. Students who take pre-clinical preceptorships may (1) be much more inclined to select clinical preceptorship experiences as part of their later training, or (2) be much more "turned on" by their clinical preceptorship experiences than those who did not take pre-clinical preceptorships. While these possibilities are for the most part speculative now, confirming or disconfirming data would have significant implications for either the funding of pre-clinical preceptorships by federal or private sources or for federal legislation which might require

medical schools to offer (or even require their students to take) preceptorships. The data base of the CREAM would provide evidence which would be directly relevant to such questions and concerns.

(c) Self Selection. The possibility that the effects of preceptorship experience on career dispositions which have been observed are due to self selection (i.e., the tendency for those who are already favorably disposed towards primary care practice in shortage areas to seek out training experiences in such areas) is very real. The question is more complicated than it first appears, and its consequences are rather far-reaching. Even if self selection is operating, it is not clear at this point whether the changes in career dispositions found in studies of the AMSA Foundation's Medical Education and Community Orientation (MECO) Project students, for example, are due solely to the MECO experience or are a result of interaction between the experience and the self selection factor.

The answer to such a question is extremely relevant for any governmental agency or private institution which is concerned with funding preceptorship programs. If it is the interaction between experience and the self selection factor which is responsible for changes in student dispositions, then any efforts to require preceptorships on a national basis would constitute an enormous waste of resources which might be better utilized in other ways. If this were indeed the finding, a more appropriate response would be to fund optional preceptorships on a scale which would permit as many of the students as possible who were interested in taking them to do so. On the other hand, if preceptorship experiences do have some favorable effects which

are independent of the self selection phenomenon, some judgment would have to be made regarding the magnitude of the effects and whether they were sizeable enough to make it worthwhile to motivate medical schools to require and operate such programs for all of their students.

Self selection is also an important factor in its own right. The data base established under this study will make it possible to determine whether it is in fact occurring, but additionally it will be possible to discover in what ways the "self selectors" differ from other students. This would be valuable information in itself which could be used in some interesting ways. For example, it might be possible for a private foundation to establish a set of preceptorship programs at model practice sites where innovative health care delivery models are being employed. Students who exhibited the characteristics of self selectors could be identified and invited by such a program to take a preceptorship at one of the model practice sites. In this way, students who would be likely to respond most favorably to such an experience could be encouraged to take "special" preceptorships, i.e., those at sites where there would be a chance to observe and participate in innovative health care delivery systems.

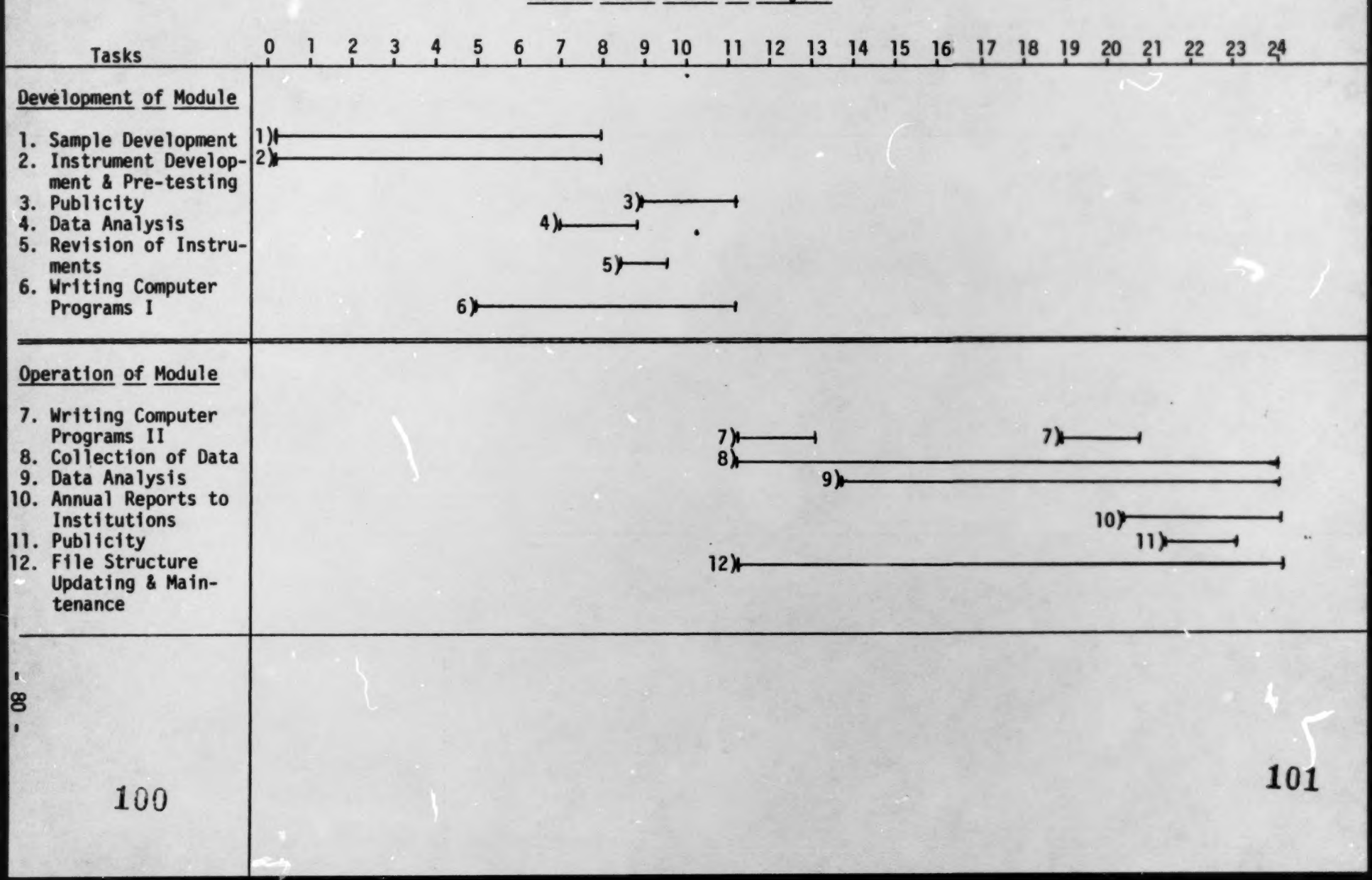
(d) Residencies. The tracking of students through their residencies offers further opportunities for pursuing the self selection factor and in general for identifying the characteristics of those students who select career paths which lead to their practicing in shortage areas. Specifically, tracking students into residency and practice makes it possible (1) to determine the characteristics which distinguish students who are

self selectors (i.e., whose natural inclinations make them select career paths leading to practice in shortage areas) from students who are not so inclined, and (2) to determine the degree to which preceptorship experiences have favorably influenced those students who might not otherwise have chosen to take primary care residencies or to practice in shortage areas.

Such knowledge would not simply be interesting data which could be put in a report and filed away on a shelf to collect dust; very practical uses could be made of such information. For example, there are residency programs which permit students to spend part of their residencies outside of the institutional setting. Such arrangements would allow programs to be established whereby residents who were identified as being the most likely candidates for practicing in shortage areas could spend their time away from their residency institutions at innovative model practice sites which have already been established around the country. Their training at these sites could focus on the non-clinical aspects of setting up health care delivery systems in areas which have not been able to attract or retain physicians. Such training would prepare them for dealing with the obstacles and hazards of initiating similar practices of their own in shortage areas. Obtaining such training would not only make it easier for them to make the decision to undertake such practices, but it would also increase the probabilities that such efforts would be successful.

Programs such as that described above could be supported by private foundations or initiated through government efforts to give residency

Time and Task Chart for the Development and First Year's Operation of the Comprehensive Research, Evaluation and Assessment Module (CREAM)


Months Since Start of Project
Tasks
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Development of Module
1. Sample Development
2. Instrument Development & Pre-testing
3. Publicity
4. Data Analysis
5. Revision of Instruments
6. Writing Computer Programs I
Operation of Module
7. Writing Computer Programs II
8. Collection of Data
9. Data Analysis
10. Annual Reports to Institutions
11. Publicity
12. File Structure Updating & Maintenance

programs incentives to develop in such directions. The actual type of training experience and administrative and financial details could have many variations on the basic theme sketched above, but in any case the key would be the identification of those individuals who, given such training experience, would be most likely to follow through by establishing model practices of their own in shortage areas. The data base developed under the system discussed here would provide a major step in that direction.

4. Module Development. A time and task chart for the development and first year of operation of the CREAM is shown in Figure 4. The third year of operation would involve the same tasks as the second year, and so is not depicted in the Figure. These tasks will be described briefly.

(a) Sample Development. This involved selecting the schools which together will satisfy the sampling requirements described in Section III. Subsequently, Deans or other administrative personnel at each of the schools will have to be contacted by mail and telephone for the purpose of arranging meetings with project personnel. These meetings are necessary to explain the nature of the study, its goals, purposes and operations, and each participating school's role in it. For those schools which elect not to participate, alternates must be selected and contacted in the same manner. For those schools which do participate, an additional meeting will be necessary for the purpose of working out administrative details and for instructing the contact person at each school in the mechanics and logistics of the data collection and liaison arrangements between the school and the project staff. Written instructions will have to be prepared and provided to each contact person.

(b) Instrument Development. As is shown in Table 4, there are six instruments which need to be developed for the operation of the CREAM; five others have already been developed. Of the six which are to be developed, four will be needed during the first year of operation of the module, while the remaining two can be developed in subsequent years (the residency and practice questionnaires). Development of the attitude, clerkship, institutional and graduate questionnaires requires some review of the literature, and pre-testing on a pilot sample.

(c) Publicity. The publicity effort is to be directed at the students at participating schools. Materials must be prepared describing the study, its operations, the nature of the data to be collected, benefits to students prior to inception of the study by the contact persons at each school.

(d) Data Analysis. This analysis is to be performed on the data generated by the pilot sample during the pre-testing of the instruments described in 'b' above. The analyses will deal primarily with frequency distributions, variances, means, and in some cases item analysis. In addition to statistical analyses, responses must be checked for patterns which would indicate poor wording or otherwise unclear items.

(e) Revision of Instruments. Based on the analyses described above, the instruments are to be revised. This may involve changing wording on some questions, deletion of some items and substitution of others, and possibly changing scales for some sets of items.

(f) Writing Computer Programs I. Several computer programs must be written prior to actual collection of data and creation of the data

base file. These programs are concerned with editing or checking the input medium for keypunching errors, with inputting the data onto the file medium, and with updating the data base file. The name and address file requires programs for putting data on the file, for checking incoming names against the file, and for updating the file. In all, some six main programs must be written or adapted (where possible), and each of these main programs may have two or more sub-routines.

(g) Writing Computer Programs II. While the programs can be written initially with sample data, it may be necessary to revise these when data from the samples begin to come in or to write additional programs to eliminate some bottlenecks in the processing and storage of data. Consequently, some programming may be required during the first months of operation during the second year. Additional programs will be required for extracting data for the analyses needed for the annual reports to participating institutions.

(h) Collection of Data. This task occurs throughout the year, since preceptorship programs occur during the entire year. While the data are collected and sent back to the study headquarters by contact persons at each school, it is also necessary for these contacts to send lists of preceptees entering programs so that these may be checked against the name and address file. Once this checking is done, packets must be prepared for each student. This may be done by the contact person, in which case he or she must be sent lists of instruments to be given each student. It could also be done at the

study headquarters, in which case the contact person would simply distribute and collect the packets. The budget as shown below assumes that the latter method is the one which is used. This method would appear to offer greater assurance that each student receives the proper materials.

(i) Data Analysis. This may occur as soon as data starts coming in, and may occur throughout the year. The specific analyses to be done would depend on the deliverables specified in the contract let by the contracting agency, were the project to be federally funded.

(j) Annual Reports to Institutions. As mentioned earlier, one incentive for school participation in this study would be to either return summaries of data or reports to them each year. The nature of such reports would have to be worked out during the initial meetings with Deans mentioned above. It is not anticipated that these reports would be tailor-made for each school separately, although certainly some acknowledgment of each school's unique differences would need to be made.

(k) File Structure Updating and Maintenance. This is a continual process. Data from preceptees is entered as it comes in, sample membership codes are changed in the name and address file as new preceptees are identified, data from comparison groups is entered yearly at a minimum, and new cases are added each year.

5. Estimated Costs. Cost estimates for the CREAM alone are shown in Table 10. These costs are estimated for a year of development and two years of operation. They do not include overhead costs, as these would have to be negotiated with the contractor selected for implementing the system. Descriptions of footnoted items may be found at the end of the table.

TABLE 10

Cost Estimates for the Comprehensive Research, Evaluation and Assessment Module (CREAM)

	Year 1	Year 2	Year 3	Subtotals
I. Staff Salaries				
A. Project Director[1] (12½% - yr. 1; 25% - yrs 2 & 3)	$3,500.00	$7,560.00	$8,165.00	$19,225.00
B. Associate Director[2] (100% time)	25,000.00	27,000.00	29,160.00	81,160.00
C. Assistant Director[3] (100% time)	18,000.00	19,440.00	20,995.00	58,435.00
D. Programmer[4] (50% - yr. 1; 30% - yr. 2; 20% - yr. 3)	8,000.00	5,180.00	3,735.00	16,915.00
E. Executive Secretary[5] (25% time)	2,500.00	2,700.00	2,920.00	8,120.00
F. Research Assistant[6] (80% time)	8,000.00	8,640.00	9,330.00	25,970.00
G. Staff Secretaries (125%-yr. 1; 175% - yr. 2; 175% - yr. 3)	9,750.00	14,750.00	15,925.00	40,425.00
H. Fringe Benefits (15%)	11,212.50	12,790.50	13,534.50	37,537.50
Subtotals	$85,962.50	$98,060.50	$103,764.50	$287,787.50

TABLE 10 (Cont'd)

	Year 1	Year 2	Year 3	Subtotals
II. Communications				
A. Postage[7]	$ 1,800.00	$2,000.00	$2,200.00	$ 6,000.00
B. Printing[8]	6,000.00	2,000.00	1,500.00	9,500.00
C. Telephone[9]	3,000.00	3,000.00	3,000.00	9,000.00
D. Materials & Services	3,500.00	3,800.00	3,800.00	11,100.00
E. MBTI Questionnaires[10]	2,500.00	250.00	250.00	3,000.00
F. MBTI Scoring[11]	0.00	17,600.00	4,400.00	22,000.00
Subtotals	16,800.00	28,650.00	15,150.00	60,600.00
III. Computer Operations				
A. CPU Time[12]	950.00	7,800.00	10,000.00	18,750.00
B. Keypunching[13]	700.00	12,000.00	3,400.00	16,100.00
C. Cards, Tapes, Misc.[14]	400.00	400.00	400.00	1,200.00
Subtotals	2,050.00	20,200.00	13,800.00	36,050.00

TABLE 10 (Cont'd)

	Year 1	Year 2	Year 3	Subtotals
IV. Auxiliary Personnel				
A. Contacts at Preceptorship Schools[15]	$600.00	$13,200.00	$13,200.00	$ 27,000.00
B. Contacts at Non-preceptorship Schools[15]	400.00	2,400.00	2,400.00	5,200.00
Subtotals	1,000.00	15,600.00	15,600.00	32,200.00
V. Travel[16]	14,000.00	7,000.00	7,000.00	28,000.00
Yearly Totals	$119,812.50	$169,510.50	$155,314.50	
GRAND TOTAL				$444,637.50

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FOOTNOTES FOR TABLE 10

1. The Project Director is a Ph.D. behavioral scientist with considerable background and experience in medical education research and specifically in the career development of physicians. His responsibility includes coordinating all of the research efforts and development of the service modules comprising the total system discussed here. His expertise in the area of physician career development provides a valuable substantive contribution to the methodology and to statistical analyses to be performed on the data in this module.

2. The Associate Project Director is also a Ph.D. behavioral scientist with experience in the general field of medical education and physician career development. This position requires research experience and expertise in quantitative analysis of social and social psychological data. Responsibilities include development of questionnaires, contacting Deans of medical schools to secure cooperation in data collection from students at various schools, supervising the collection of data from medical schools, supervising the processing of that data for input to storage files, creation of data storage files, analysis of data, and preparation of reports to medical schools and funding agencies.

3. The Assistant Director is a Ph.D. behavioral scientist with training in research methodology and statistics. Experience in the field of medical education is desirable but not necessary. Some computer experience is helpful, at least to the extent of using packaged statistical computer programs. Responsibilities mainly involve assisting the associate project director in the responsibilities mentioned above.

4. The Programmer position should be filled by someone with a degree in computing science and some experience in developing data base files.

5. The Executive Secretary is responsible for coordinating the activities of the secretarial staff for the entire project described here. Reporting to the Project Director, this person must have experience in clerical supervision and be able to coordinate work load distributions among the secretarial staff.

6. The Research Assistant should have a B. A., preferably in one of the behavioral sciences. A knowledge of research methodology is important.

7. The estimate for postage is based on the need for general correspondence with medical schools contacted for sampling purposes and for mailing instruments to approximately 20 schools, and for return postage for completed questionnaires. Schools with optional or required preceptorships will have such correspondence throughout the year with the project staff.

FOOTNOTES FOR TABLE 10 (Cont'd)

8. Printing requirements are for letterhead stationery, instruments (estimated as equivalent to eight 4-page forms @ $500/form), for brochures describing the system, and for form letters to students.

9. Telephone figure covers a WATS line for 10 hours/month @ $250/month.

10. Includes 5,000 MBTI questionnaires and answer sheets @ $.50/set; and 5,000 answer sheets @ $.10 each.

11. Based on a rate of $2.00/case for scoring at the Center for Applications of Psychological Type (CAPT). If the MBTI module described in part C of Section V were to be funded, this cost would be covered under the expenses for that module and would not need to be included in the costs of the CREAM.

12. Based on rates for outside users at the University of New Mexico Computing Center. First year's usage is primarily for program testing and preliminary file construction. Remaining years cover analyses of data accumulated in the file during those years; these figures reflect the costs of processing large numbers of cases and variables.

13. First year's figure includes punching of programs written for this module; second and third year estimates are based on 6 cards per students plus 6 additional cards for preceptees, and a total of approximately 8,800 cases during the first year of data collection. Third year includes cards for new students entering the system and for students who take preceptorships. Both latter years also include additional program testing.

14. Includes cards necessary for running file construction and data analysis jobs; tapes for storing, extracting, and analyzing data; disk pack and other rental items at computing center.

15. Auxiliary personnel are needed at each medical school to administer instruments to students, to send completed questionnaires back to project headquarters, and to answer students' questions regarding the system or to refer student questions to project staff members. Contact persons at those schools having preceptorships must also make certain that the project staff receives lists of students who are going to be taking preceptorships at certain times so that packets can be prepared for these students. The figures for the first year are for orientation sessions of approximately a day and a half for the secretary/clerks who will serve as auxiliary personnel at each medical school. Secretaries at schools with preceptorships will be needed for 1/8 time during the second and third years @ $3.75/hour; secretaries at non-preceptorship schools will be needed for roughly 80 hours per year. Figures are based on an assumption of 12 schools with optional or required preceptorships and 8 with no preceptorships.

FOOTNOTES FOR TABLE 10 (Cont'd)

16. Includes travel to contact schools for obtaining cooperation and participation in system and orientation sessions for auxiliary personnel; second and third year figures include follow-up trips for orienting new contact personnel if necessary or for ironing out any substantive or procedural difficulties; estimated @ $350/trip to 20 schools (2 trips during first year and 1 trip/school in years 2 and 3).

C. Myers-Briggs Type Indicator Feedback Module (MBTI)

This module provides students with feedback from the scoring of the MBTI, the personality instrument used in the tracking system. The MBTI identifies 16 different personality types, and the scoring of the instrument, when done at the Center for Applications of Psychological Type (CAPT), produces 16 different printed texts corresponding to each of the 16 personality types. Students thus receive semi-individualized descriptions of the activities and psychological functioning preferred by persons of their personality type as determined by the MBTI. For those not familiar with the Type Indicator, Appendix A provides a description of its concepts and the major personality preferences it assesses.

As envisioned in the context of the tracking system described above, this feedback can be modified and combined with other data to provide students with information about themselves and about the characteristices of 14 different specialties and 8 work settings. The module as described below does not attempt to counsel students or to suggest to them which career paths they should choose. This module will be given to students during their freshman or sophomore years, and at this stage in their careers most students are exploring career possibilities in the world of medicine and are still learning about themselves with respect to their abilitites, potentials, and preferences for doing the various kinds of things physicians do. Directive career counseling may not be desirable during pre-clinical years, and in fact many students seem to prefer doing their own career exploring and making their own decisions, and they often resent anyone trying to tell them what they should do in choosing a career path.

At the same time, students are very receptive to information about themselves as compared to other students and physicians and to information about the varoius career alternatives confronting them. They like to have such information available and to be able to sort through it and reach their own conclusions about what is best for them. For students entering the system as freshmen, the MBTI module is the first information service which the system will provide, and its focus is directed towards giving students information about themselves and their preferences and about the activities and characteristics of selected specialties and work settings.

Unlike the other service modules, the MBTI module will be available initially only to students who are in the tracking system, since they are the only ones for whom MBTI scores will be available. With the other modules, attempts will be made to inform students at all schools of the services available. No such attempt will be made regarding the MBTI module. However, students who learn of if and wish to receive feedback from it will be allowed to do so providing they are willing to pay the cost of scoring the instrument.

1. Module Development. In order to be used as a service module in the tracking system, there are two main tasks which need to be undertaken, neither of which involves a great deal of time. The first of these is to prepare new descriptions of each of the 16 personality types which the present computer scoring system at the CAPT can print out along with individual scores. The present type descriptions which are put out with scores are quite general since they are not tailored to any specific profession. These type descriptions can, however, be made much more relevant to various professions and to physicians in particular. More profession-specific descriptions relevant to physicians are needed if this

module is to provide the kind of information which students would find useful and which would demonstrate to them the value of their participation in the tracking system.

The second task which needs to be undertaken to implement this module is to assemble empirically based descriptions of selected specialties and work settings which can be included in the information package given to students via this module. Such data has already been collected and analyzed under a contract with the Health Resources Administration (HRA #1-MI-24197). This contract produced a national survey of physicians in practice which resulted in (a) MBTI scores on approximately 470 physicians, (b) extensive data on the characteristics and activities associated with some fourteen specialties and a variety of work situations such as institutional, solo private, small group, and mixed large group settings; and (c) data on the sources of physician satisfaction associated with the characteristics of these specialties and work settings. Such data would provide information on career alternatives which had a direct correspondence to the kind of personality preference information given to the student in his individual type description. The primary requirement for this task involves putting the existing data in a form which makes it easily comprehensible and useful to students.

2. Module Operation. The operation of the module is quite simple. It involves (a) administering the MBTI to students in the tracking system; (b) sending the answer sheets to the CAPT to be scored; (c) returning the scoring results to the tracking system's center of operations; and (d) putting the MBTI in the same envelope as the specialty and work setting information and mailing these to each student.

3. Estimated Costs. The cost estimates for providing the kinds of information described here to students are shown in Table 11. These costs reflect only the expenditures needed for providing students with the information service; costs of administering the MBTI are included in the cost figures for the tracking system in Table 10. The consultants shown in Table 11 are Isabel Briggs Myers, author of the MBTI; Mary McCaulley, Director of the CAPT; and Naomi Quenk, who conducted the survey of physicians under contract HRA #1-MI-24179. These persons would be required in order to accomplish the development tasks mentioned in part 1 above.

Scoring of the Type Indicator for students in the tracking system would be done at the CAPT and would necessitate the creation and use of a special tape by the CAPT; the figure of $2.00 per instrument scored covers these costs.

TABLE 11

Estimated Costs for Revision and Use of MBTI Feedback from CAPT

	Year 1	Year 2	Year 3	Subtotal
I. Consultants[1]	$ 1,500.00	------	------	$ 1,500.00
II. Travel[2] (2 persons X 2 trips @ $400/ person/trip)	$ 1,600.00	------	------	$ 1,600.00
III. Scoring and Postage[3]	------	$18,600.00	$ 4,650.00	$23,250.00
Yearly Totals	$ 3,100.00	$18,600.00	$ 4,650.00	
GRAND TOTAL				$26,350.00

FOOTNOTES FOR TABLE 11

1. Isabel Briggs Myers, author of the MBTI, and Mary McCaulley, Director of the Center for Applications of Psychological Type (CAPT), where scoring of the MBTI is to be done.

2. Travel is for the purpose of meeting with the staff operating the CREAM for the purpose of revising the type descriptions which are returned with scoring results. Revisions are needed to make the type descriptions more directly relevant to medical students in training.

3. Scoring is figured at $2.00 per subject. Results would have to be mailed from the CREAM operations center to students participating in that study in order to add the supplementary information mentioned in the preceding discussion of the MBTI feedback module.

D. Preceptorship Information Module (PIM)

Briefly, this module is a computerized system which has the following functions:

(a) It provides clinical year students with information about preceptorship programs throughout the country. It allows students to indicate various criteria by which they may wish to select a preceptorship, e.g., geographic location, and returns to them information about the programs and sites which meet their selection criteria.

(b) It provides a means by which preceptorship programs may locate and contact students who have expressed an interest in preceptorships having specified characteristics.

(c) It provides students with an incentive for participating and remaining in the tracking system.

The module will be national in scope in that it will be available to students in all parts of the country and will include preceptorship programs in all parts of the country. Students will not have to be in the tracking system to use the module. However, there are several constraints which will be employed regarding type of programs and career stages of students.

1) The preceptorships to be included will be limited to programs involving a clinical experience of four or more weeks in an off-campus underserved setting in which a junior or senior medical student participates directly in patient care in a primarily non-hospital environment (such as a community or private clinic or a physician's office). Those programs sponsored by medical schools which are open only

to students attending the sponsoring school will not be included in the module. Pre-clinical preceptorships, or those offered only to freshmen or sophomores will not be included in the system, mainly because there are not a sufficient number of such programs which are open to all students to make their inclusion worthwhile either to students or to the module's operation.

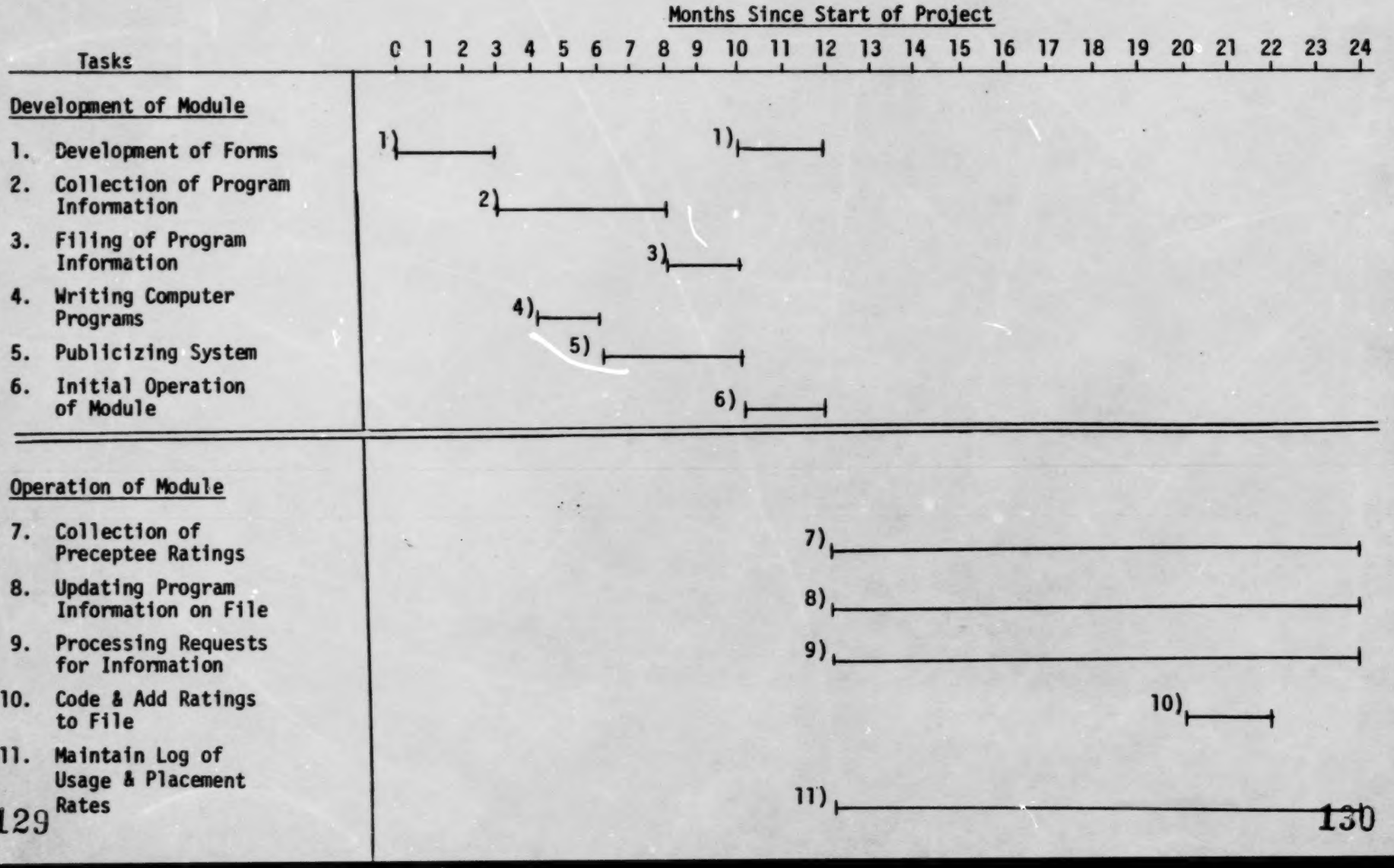
2) The module will be made available primarily to junior and senior students in all medical schools in the country, although if sophomore students wanted to use the system for "exploratory" purposes, they would be permitted to do so. While "closed" preceptorship programs will not be included in the module, it nevertheless seems desirable to offer the information service to students attending schools which have either closed or required preceptorship programs of their own. Students whose schools offer closed but optional preceptorships may wish to take a preceptorship other than the one available through their own school. Students whose schools require a preceptorship experience may wish to take additional such expereinces. It would seem important to include these types of students as well as students whose schools offer no preceptorships at all. Doing so would provide additional insight regarding the effects of preceptorship opportunity structures on student career paths.

1. Module Development. A time and task chart for the development and operation of the module is shown in Figure 5. These tasks will be described briefly.

(a) Development of Forms. There are four basic forms which are necessary for the operation of this module: the preceptee request for

FIGURE 5

Time and Task Chart for the Development and Operation of the Preceptorship Information Module (PIM)


Months Since Start of Project
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Tasks
Development of Module
1. Development of Forms
2. Collection of Program Information
3. Filing of Program Information
4. Writing Computer Programs
5. Publicizing System
6. Initial Operation of Module
Operation of Module
7. Collection of Preceptee Ratings
8. Updating Program Information on File
9. Processing Requests for Information
10. Code & Add Ratings to File
11. Maintain Log of Usage & Placement Rates

information; the program request for listing of applicants; the program information form; and the preceptee rating of his preceptorship experience.

(i) Preceptee Request for Information. This form is sent to students who request to use the system. On this form, the student is asked to enter information such as his name, address, brief biographical data, and his preferences regarding preceptorships. This latter is limited to at most five criteria. Experience with analogous information systems in other fields suggests that it is difficult to find matches using more than a very small number of criteria and that students in fact find it hard to utilize more than a few pieces of information in making choices.

(ii) Program Request for Applicant Listings. Some preceptorship programs in the past have had difficulty filling openings in their programs. Consequently, some programs may wish to seek out and to contact students who have expressed an interest in certain types of programs. By filling out this form, preceptorship programs may request a list of students whose expressed preferences match those of the program. Such requests can be processed using the same computer files and programs that are used to process student requests.

(iii) Program Information Form. These forms are used to collect from preceptorship programs such data as geographic location, sponsorship, stipend and travel reimbursement, duration, and time slots available. The form also allows programs to write a brief one-paragraph summary describing in greater detail the nature of the sites and program. This narrative description is printed out to a student when he is sent a list of preceptorships which meet his criteria.

(iv) Preceptee Rating of his Preceptorship Experience. This form is used to gather information concerning the nature of a student's activities and experiences while in his preceptorship, as well as his ratings of and reactions to those experiences. This form will not be used for evaluating preceptorship programs, but rather will serve two other purposes. It will provide the system with additional information about the preceptorships which can be included in the print-out sent to subsequent students; and it will serve as a basis for reports to programs on student reactions to their preceptorships.

(b) Collecting Program Information Information about preceptorship programs and their sites will be collected by contacting these programs initially by mail. This initial contact will explain the nature, purposes, and benefits of the module and ask that program directors fill out the information forms necessary for including their programs in the system. Non-responders will be followed up by telephone contact. Participation is voluntary, and by specified cut-off date no further efforts will be made to contact programs. The data which has been received to that point will be entered in the file (See Figure 5). It will still be possible, however, for programs to enter the system at any time.

Preceptee ratings of their experiences will not be available during the first year of operation of the module, but this data will be collected during that time and added to the files by the beginning of the second year of operation. The data will be collected either by the personnel of each program or by mail-back to the PIM operations center, whichever appears to be most feasible in each particular case.

(c) Putting Program Information on File. Program information will be stored on tape. This task involves keypunching preceptorship program data first, with an estimated 30 cards needed per program. The tape must be tested to be certain all data have been stored and are accessible. Several back-up tapes must also be created.

(d) Writing Computer Programs. Several programs must be written for this module. The first of these is the program which processes student requests for information and preceptorship program requests for applicant listings. An output sub-routine will also be necessary. This sub-routine will provide formatting for the printing out of information to users of the system. It should be capable of printing user names and addresses in such a manner that outputs to users can be mailed directly without having to be put into envelopes. It may also be necessary to have a program for updating the tape file of program information. Such updating will occur at least annually, but may also be done whenever information is received from preceptorships that they no longer have any openings for the remainder of the system's operational year. Such programs may be available as "canned" software at some computer installations, but if not, one will have to be written for this module.

(e) Publicizing the System. The publicity effort can be begun some four to five months before the system becomes operational. Publicity will take the form of letters, posters, and inquiry forms mailed to Deans of Students at all medical schools and to AMSA chapters at each school. Advertisements may also be placed in various media reaching students, such as The New Physician. Where possible, notices will also be placed in student mail boxes at each school.

2) Module Operation. As illustrated in Figure 5, operation of the module is scheduled to begin ten months after the start of the project. If the project begins in June, this will mean that the system will be operational in time for students to use the module for selecting and applying for summer preceptorships. It is believed that this is the most desirable time frame since many more students are seeking preceptorships for the summer than at other times of the year.

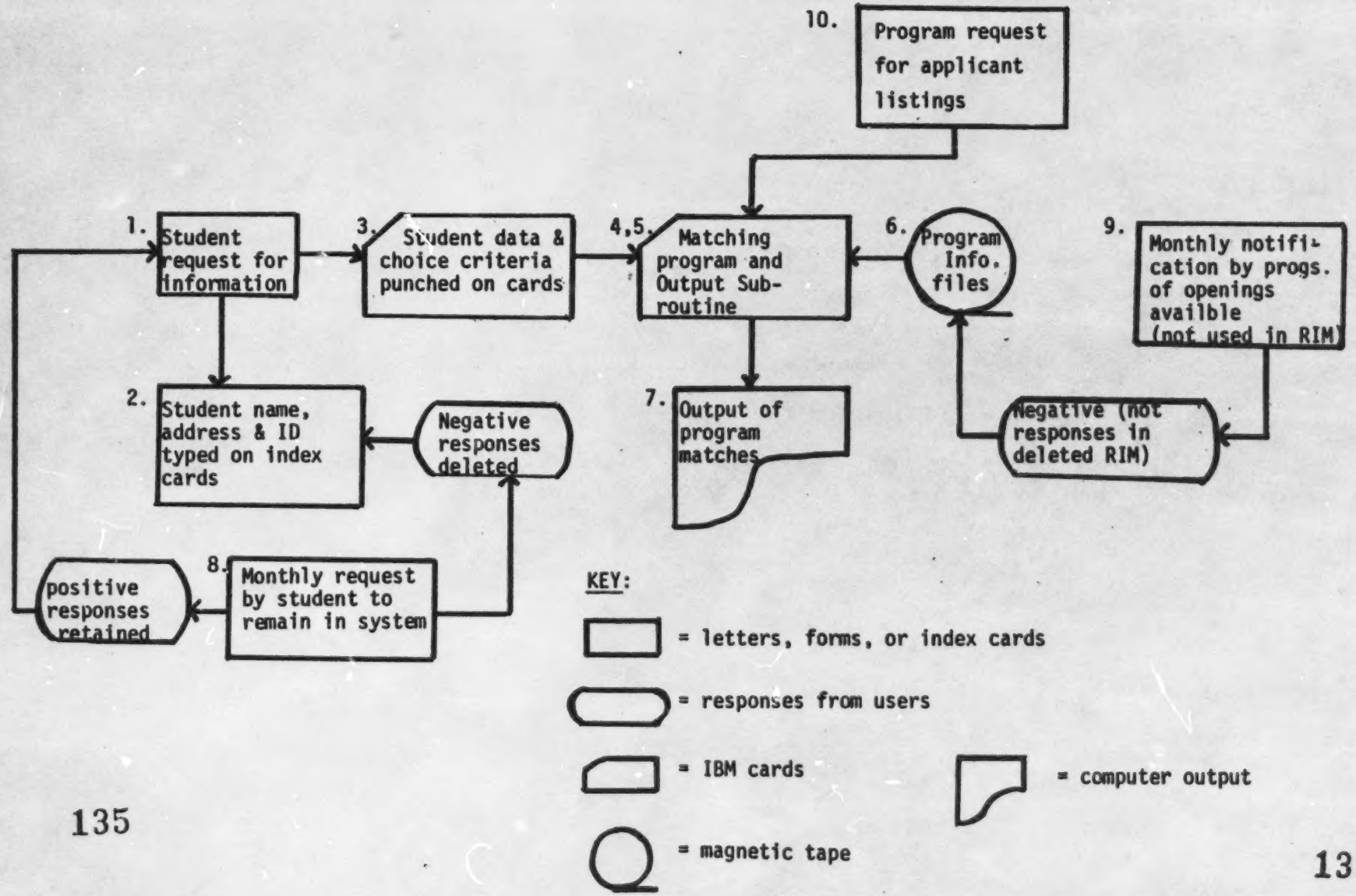
The tasks involved in operating the module are shown in Figure 5. Most of these tasks are ongoing throughout the operation of the system. A more detailed illustration of the computerized operations and basic components of the module is given in Figure 6. The components illustrated in Figure 6 have been numbered and will be discussed in the order of their numbers below.

1) In response to student requests for information about the system, students are mailed the following: (a) a brochure describing the system, its purposes, its scope, and the nature of the services available; (b) a pre-coded form to be filled out supplying the student's selection criteria and personal data such as name, address, etc.; (c) a set of instructions for filling out the form. The user request form itself will be kept as simple as possible, both for ease in filling it out and for ease in keypunching from it.

2) Upon receipt of a user request form, the student is given an ID number and certain basic information from his/her form is typed on index cards and filed along with similar cards for other students. This file is

FIGURE 6

Computerized Operations and Basic Components of the PIM and RIM


10. Program request for applicant listings
1. Student request for information
3. Student data & choice criteria punched on cards
4,5. Matching program and Output Sub-routine
6. Program Info. files
9. Monthly notification by progs. of openings availble (not used in RIM)
2. Student name, address & ID typed on index cards
Negative responses deleted
7. Output of program matches
Negative (not responses in deleted RIM)
8. Monthly request by student to remain in system
positive responses retained
KEY:
= letters, forms, or index cards
= responses from users
= IBM cards
= computer output
= magnetic tape

used as a means of visually identifying students who are currently in the system. Such a visual system is more efficient for small numbers (say, fewer than 10,000) than keeping such information on tape, which requires continual updating during the operation of the system and complex programs to perform such updating.

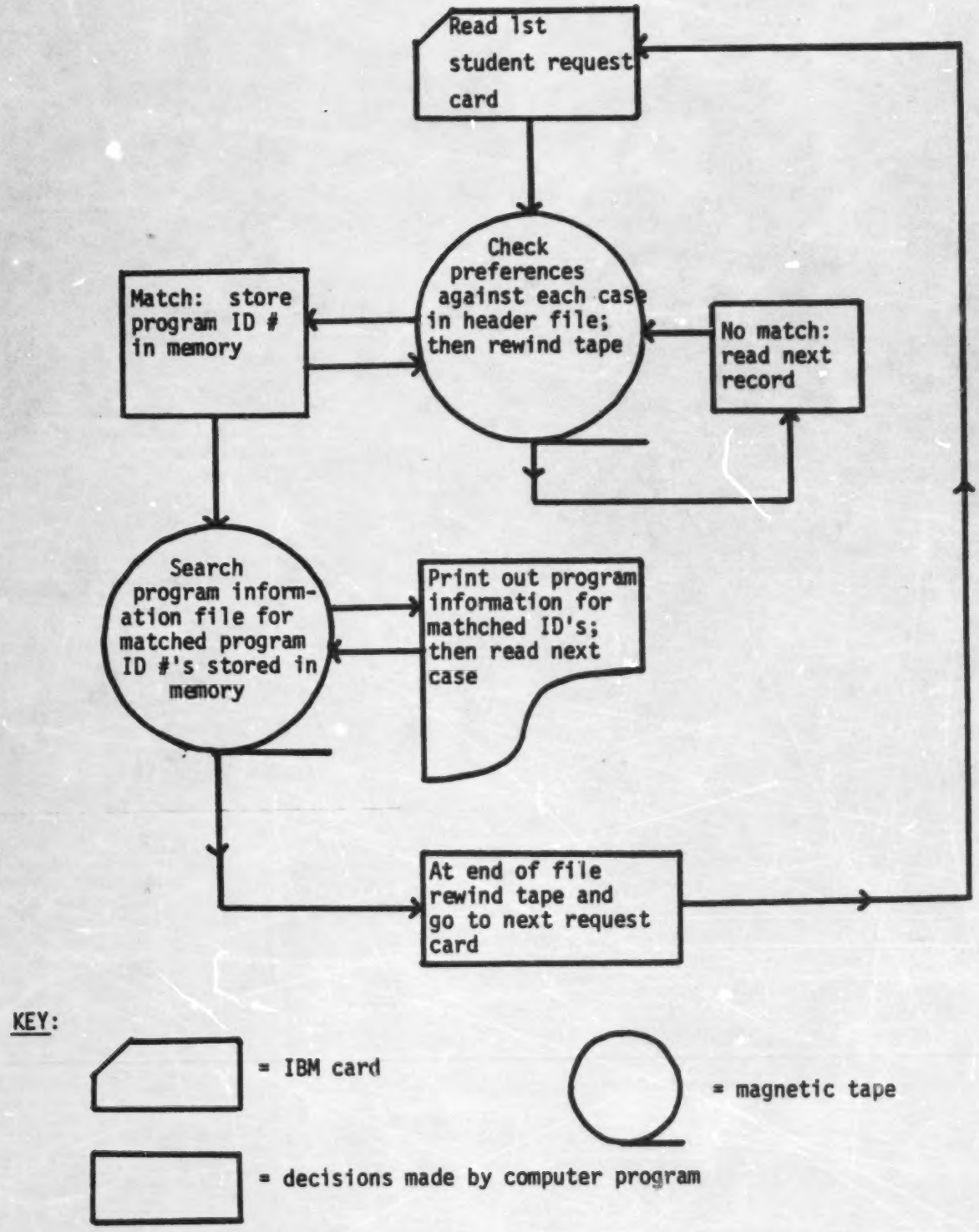
3) Data from a student user request form is also punched on cards for input to the computer part of the system. This data includes the student's name, address, and selection criteria.

4,5) The selection program and output sub-routine process inputs from student request cards and from the program information file. A general flowchart of the operations of the selection program is shown in Figure 7. This program reads a student request card and checks the coded preferences against a "header" file which contains codes corresponding to the characteristics of the various preceptorship programs in the information file. When a match is found between the student preference codes and the characteristics of one of the programs in the file, the ID number of that program is stored in memory, and the program then proceeds to make a similar check of the next program's codes on the header file. When the header file has been completely checked, the program then reads through the file containing all of the narrative descriptions of the programs and prints out the descriptions of those programs whose ID numbers have been temporarily stored in memory. The tapes are rewound and the program returns to read the next student request card.

6) The program files contain the program characteristics codes and narrative information about each preceptorship program and its sites, all of which are stored on tape. It is more efficient for programming purposes to have two tapes: a "header" file containing characteristics codes for each program,

FIGURE 7

General Flowchart of Operations of Selection Program for PIM and RIM


Read 1st student request card
Check preferences against each case in header file; then rewind tape
Match: store program ID # in memory
No match: read next record
Search program information file for matched program ID #'s stored in memory
Print out program information for mathched ID's; then read next case
At end of file rewind tape and go to next request card
KEY:
= IBM card
= magnetic tape
= decisions made by computer program

and a file containing descriptive information which can be printed out to students. This strategy also results in greater flexibility were the PIM matching computer program to be used for the matching task in the RIM module.

The storage of information on both of these tapes is sequential, i.e., cases (programs or sites) are simply placed one after the other on the tape, without being given any particular order or structure. The same remarks about the advantages of sequential storage for small data sets apply here as were mentioned earlier in regard to the CREAM files. There should be two back-up tapes at all times, in addition to the tapes in use.

7) Output will vary, depending on the nature of the request. Requests from students will contain a listing of preceptorships which meet their criteria. Requests from programs for applicant listings will contain names and addresses of those students whose selection criteria match those of the preceptorship making the request.

8) On a monthly basis, students in the system will be sent post cards asking them whether or not they have been accepted into a preceptorship program and whether they wish to remain in the system. They will be provided with a return post card to indicate their status. Students not responding will be deleted from the active file and their cards placed in an inactive file.

9) Also on a monthly basis, preceptorship programs in the system will be asked to notify the system's operating center of any changes in the availability of openings in their programs. Since preceptorships generally last anywhere from four to twelve weeks or so, there may be several time slots open during the year for students. So long as a

program has at least one such slot open during a specified time span, it will remain in the system. The time span to be used ends with the month of August. In other words, at any given time, the programs retained in the system's file will all have at least one time slot open between the date of the student's request and the following August.

In August, prior to the beginning of most school year terms, programs which have been in the system anytime during the preceding year will be sent a copy of the file's information on that program and asked to update it if necessary. Updating of the file information will be done during August so that the system will be ready for service at the beginning of the term for most schools. It should be pointed out that programs which are deleted from the system at sometime during the year are deleted only until the following August, at which time they are re-entered.

10) It may be the case that some preceptorship programs which have had difficulty filling positions in the past may wish to contact prospective students in an effort to fill slots in their programs. To provide for this need, the system is designed so that such programs may request lists of students in the system whose preferences match the characteristics of the program. In response to such requests by programs, a request form will be sent along with instructions for filling it out.

One other feature of the operation of the module is worthy of mention. This is the maintenance of a log of usage and placement rates. Such a log is not directly essential to the service provided by the module, but it does offer useful information. This log can be used to evaluate the

"success" of the module in placing students in preceptorships. Analysis of such rates would be very informative regarding not only the success of the module's service, but also the demand for preceptorships relative to the number of openings. This type of information would be of significant value in decisions regarding the funding of preceptorship programs. The log would also help in determining the fee which would have to be charged to cover the cost of the module's operation and thus could shed light on the feasibility of the module's becoming self-sustaining.

3. Estimated Costs. Cost estimates for the PIM alone are shown in Table 12. These costs are estimated for three years, the first year of which includes ten months for development and two months of operation. The remaining two years involve the continued operation of the module and the addition of preceptee ratings to the program information file.

Table 13 gives some estimates of the usage rates and user fees which might be needed to support the operation of the module. These are only estimates, and the log mentioned above should provide more precise figures. One further point which deserves mentioning here is that while many of the operational tasks in the module are clerical, the (at least part time) involvement of a Ph.D. who is experienced in the general field of medical education is needed during the first three years to bring the system up to the point at which it could be maintained by clerical and lower level administrative personnel. After the "kinks" have been ironed out of the system and after the mechanism and procedures for adding and updating student ratings of their experiences have been developed, the system could be run by other personnel. Table 13 reflects the costs which would be needed to maintain the module with non-Ph.D. level staff.

TABLE 12

Estimated Costs for Preceptorship Information Module (PIM)

	Year 1	Year 2	Year 3	Subtotals
I. Staff Salaries				
A. Project Director[1] (25% year 1; 12½%-years 2 and 3)	$ 7,000.00	$ 3,780.00	$ 4,080.00	$ 14,860.00
B. Associate Project Director[2] (50% time)	12,500.00	13,500.00	14,580.00	40,580.00
C. Programmer[3] (15%-year 1)	2,400.00	1,730.00	------	4,130.00
D. Executive Secretary (10%-year 1; 12½%-years 2 and 3)	1,000.00	1,350.00	1,460.00	3,810.00
E. Staff Secretary (100% year 1; 50%-years 2 and 3)	7,800.00	4,210.00	4,550.00	16,560.00
F. Fringe Benefits (15%)	4,605.00	3,685.00	3,700.00	11,990.00
SUBTOTAL	$35,305.00	$28,255.00	$28,370.00	$ 91,930.00
II. Communications				
A. Postage[4]	$ 600.00	$ 3,500.00	$ 3,500.00	$ 7,600.00
B. Printing[5]	1,500.00	800.00	800.00	3,100.00
C. Publicity[6]	1,000.00	1,000.00	1,000.00	3,000.00
D. Telephone[7]	3,000.00	3,000.00	3,000.00	9,000.00
E. Materials & Supplies	1,200.00	1,200.00	1,200.00	3,600.00
SUBTOTAL	$ 7,300.00	$ 9,500.00	$ 9,500.00	$ 26,300.00

TABLE 12 (CONT.)

Estimated Costs for Preceptorship Information Module (PIM)

	Year 1	Year 2	Year 3	Subtotals
III. Computer Operations				
A. CPU time[8]	$ 930.00	$ 2,100.00	$ 2,400.00	$ 5,430.00
B. Keypunching[9]	1,000.00	800.00	800.00	2,600.00
C. Cards, tapes, misc.[10]	200.00	200.00	200.00	600.00
SUBTOTAL	$ 2,130.00	$ 3,100.00	$ 3,400.00	$ 8,630.00
Yearly Direct Cost Totals	$44,735.00	$40,855.00	$41,270.00	
GRAND TOTAL DIRECT COST				$ 126,860.00

FOOTNOTES FOR TABLE 12

1. The Project Director is a Ph.D. behavioral scientist with considerable background and experience in medical education research and specifically in the career development of physicians. His responsibility includes coordinating all of the research efforts and development of the service modules comprising the total system discussed here. His expertise offers a substantive contribution to this module in assuring that it is developed in such a way as to offer a meaningful and relevant service to students. His reduced time in the second and third years reflects the fact that the main service and substance involved in the module's operation will have been completed. His continued time during the remaining two years is directed toward adding the preceptee ratings to the information files and offering meaningful reports to preceptorship programs.

2. The Associate Project Director is also a Ph.D. behavioral scientist with experience in the general filed of medical education and physician career development. This position's responsibilities are concerned with developing forms, contacting and obtaining the cooperation of preceptorship programs, coordinating efforts with them where possible, supervising the development and operation of the module. His expertise regarding physician career development is required to make certain that the services develop in ways that are most effective in terms of providing needed information to students.

3. The Programmer should be someone with a degree in computer science, preferrably with some experience in working with data base systems. His first year's time is devoted to developing the programs for operating the system, while the second year's time involves adding preceptee ratings to the file and developing any programs needed for updating these ratings later.

4. Postage covers mail contact with an upper limit of 200 preceptorship programs and/or sites and two months of processing user requests during the first year. The second and third year figures are based on an estimated 2,000 users per year, with correspondence on a monthly basis. Information to users must be sent first class in order to make the module's services effective.

FOOTNOTES FOR TABLE 12 (CONT.)

5. Printing includes the printing of four forms, a brochure describing the system, and letterhead stationery.

6. Publicity includes cost of posters and ads in student media such as The New Physician.

7. Covers WATS line charges for 10 hours/month @ $250/month. Provides students with a toll free number for inquiries. Provides module staff with a quick means of contacting preceptorship program directors when necessary.

8. Based on rates for outside users at the University of New Mexico Computing Center; other installations may have different rates. An estimated 3 hours of time are needed the first year for testing programs, establishing information files, and processing 2 months of user requests. Computer times for years 2 and 3 cover updating files, adding preceptee ratings, and processing user requests for a full year.

9. Covers keypunching of preceptorship program information for a maximum of 200 programs and an estimated 30 cards per program; also punching of computer programs written for the module.

10. Covers cards for running computer programs, tapes for operating the system, back-up tapes, and necessary rental facilities and materials at the computer installation.

TABLE 13

Estimated Costs and User Fees Required for Sustaining PIM after Initial 3-year Development Period

I.	**Staff Salaries**	
	A. Associate Director[1] (5% time)	$ 1,460.00
	B. Programmer[2] (5% time)	940.00
	C. Administrator[3] (20% time)	2,400.00
	D. Staff Secretaries (100% time)	9,100.00
	E. Fringe Benefits (15% of salaries)	2,085.00
	SUBTOTAL	$ 15,985.00
II.	**Communications**	
	A. Postage	$ 3,500.00
	B. Printing	800.00
	C. Publicity	1,000.00
	D. Materials & Supplies	1,200.00
	SUBTOTAL	$ 6,500.00

TABLE 13 (Cont.)

Estimated Costs and User Fees Required for Sustaining PIM after Initial 3-year Development Period

III.	Computer Operations	
	A. CPU Time	$ 2,400.00
	B. Keypunching	800.00
	C. Cards, tapes, misc.	200.00
	SUBTOTAL	$ 3,400.00
	GRAND TOTAL DIRECT COSTS PER YEAR[4]	$ 25,885.00

TABLE 13 (Cont.)

IV. Number of Users		Approximate Fee Required to Break Even		Income
1200	X	$ 21.60	=	$ 25,920.00
1400	X	18.50	=	25,900.00
1600	X	16.00	=	25,600.00
1800	X	14.40	=	25,920.00
2000	X	12.90	=	25,800.00
2200	X	11.75	=	25,850.00
2400	X	10.75	=	25,800.00
2600	X	10.00	=	26,000.00
2800	X	9.25	=	25,900.00
3000	X	8.60	=	25,800.00

FOOTNOTES

1. The Associate Director's time is mainly for correspondence with persons other than student users; this might include programs or other parties who were simply interested in learning about the module.

2. The Programmer's time is mostly for trouble-shooting should the need arise, and for consultation should it become necessary to implement changes in some part of the system's operation.

3. The Administrator should be someone with a B.A. with the background and training necessary for supervising a clerical staff and for keeping the operations running smoothly.

4. These costs only cover operation of the module and do not include overhead which would be required for housing the project. Obviously the project would have to be subsidized or sponsored in this respect, otherwise these overhead costs would have to be added on to the figure given here.

E. Residency Information Module (RIM)

This module was described earlier as providing students with an incentive to remain in the tracking system, and as contributing something of value apart from its role in the overall system proposed here. Briefly, the module is a computerized system similar to the PIM, but having different substantive content. Its functions are as follows:

(a) It provides students who are seeking residency positions with information about primary care residency programs throughout the country. Initially, it will offer information about family practice residencies, with other primary care specialties to be added to the module in subsequent years. The module allows students to indicate various criteria by which they wish to select a family practice residency and returns to them information about the various programs meeting their criteria.

(b) It provides a means whereby family practice residency programs may identify and contact students whose expressed preferences match those of the program which is seeking a listing of potential student applicants.

(c) It provides students who have entered the over-all system with an information/service incentive to remain and participate in the tracking system.

The module will be national in scope in that it will include family practice residencies across the country. It will also be offered to medical students at all medical schools; use of the module is not contingent upon being in the tracking system proposed here. However, there are some constraints on what will be offered, as was mentioned above. For the first year the module will be limited to family practice residencies. This is to allow time to iron out

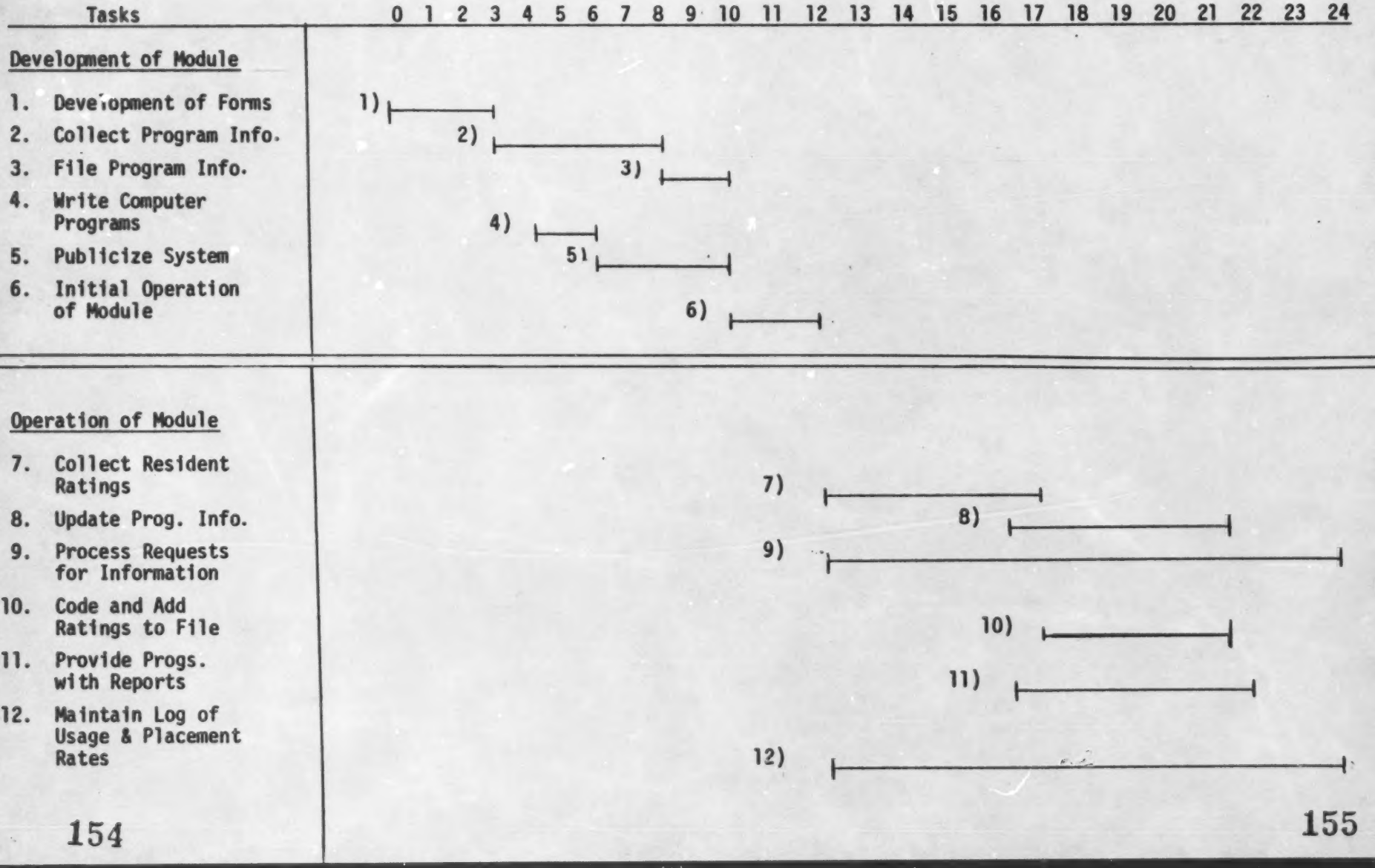
any administrative and logistical difficulties which may be encountered in operating the system. It is thought that it would be better to work out these problems while they are on a scale that is manageable rather than attempt to work out all such problems while trying to develop a module that would be over five times larger than one limited to family practice. The other reason for limiting the first year's effort to family practice programs is concerned with staffing. The staff size needed to develop and implement a module which would include all primary care residencies would be immense, and yet not all of the staff would be needed once the module had become smoothly operational. It would be better by far to develop the module in stages and to utilize the same staff for each stage. In that way their experience would be of great help in developing successive stages.

In its purposes and content, the module in no way duplicates the National Internship and Residency Matching Program. That system's purpose is to put applicants and programs together after applications have been made by prospective residents. The RIM, on the other hand, fulfills its major functions prior to the time when applications are made. The RIM gives students information they can use to determine which residencies they will consider applying for and perhaps contact further before making application. The book put out by the National Internship and Residency Matching Program does not give students the kind of detailed information they need to identify those programs having the characteristics or emphases for which they are looking.

1. Module Development: A time and task chart for the development and operation of the RIM is shown in Figure 8. The chart covers only two

FIGURE 8

Time and Task Chart for the Development and Operation of the Residency Information Module (RIM)



years, the year of development and the first year of operation. The same chart applies to all stages and specialties which might be included. That is, where the second stage (incorporating pediatrics into the module) is to be implemented, its development would occur during the first full year of operation of the family practice stage, and would include the same developmental tasks that are shown for the family practice stage in Figure 8. These tasks will be described here briefly.

(a) Development of Forms. There are four basic forms which are necessary for the operation of this module: the student request for information; the program request for listings of potential applicants; the program information form; and the residents' ratings of their experience in their programs.

(i) Student request for information. This form is sent to students who request to use the system. In the case of students who are involved in the tracking system, this form may be sent to them automatically in junior and senior years as an incentive to remain in the system. On this form, the student is asked to give essential information such as name, address, and brief biographical data, and select from the list provided up to five criteria reflecting his preferences regarding family practice residency programs.

(ii) Program request for student listings. Some residency programs may wish to contact students who have expressed an interest in family practice residencies. This form will enable such programs to request a listing of students whose preferences match the characteristics of the program making the request. Students will be informed upon applying

for the services of this module that their names and addresses will be made available to programs for such purposes.

(iii) Program Information Form. These forms will be used to collect data from residency programs such as geographic location, institutional setting, program emphasis and educational objectives, salaries, and application requirements and procedures. The form will also permit programs to write a brief narrative description of what the program has to offer. This description will be printed out to students when they receive a list of the programs which matched their expressed preferences. Constraints in terms of computer storage and inputting procedures may necessitate non-substantive editing of these descriptions in some cases.

(iv) Resident Rating of his Experience in the Program. This form is used to gather information concerning the nature of the resident's activities and responsibilities. The data will not be used for purposes of evaluating the programs, but rather will be entered in summary form into the descriptive computer file for each program. It can be used to provide subsequent students with further information about the programs, as well as to provide programs with reports and/or data summaries.

(b) Collecting Program Information. General and family practice residency programs will be contacted initially by mail and by following-up telephone calls. Mailings to programs will include information about the goals of the module, its operations, its procedures, and instructions for filling out the forms necessary for participating in the system. Benefits of participating and the opportunities for recruiting residents will also be explained in this material. It may also be desirable to make the collection

of resident ratings of their program experiences optional at the discretion of program directors

(c) Writing Computer Programs. Several programs must be written for this module, and these programs are very similar to those required for the PIM. The first program processes student requests for listings of those programs which match the preferences expressed by the student. The same program will also process program requests for listings of students whose expressed preferences match those of the program making the request. An output sub-routine will provide formatting for the output of listings for each request. A program will also be needed for updating the file containing program information, and if a canned program is not available at the computer installation where this module is operated, such a program will have to be written. In its initial year of operation, student preference information may be kept on cards which can be stored in an indexed filing system. However, if the number of student participants in the system becomes very large (e.g., 10,000 or more) then it may be necessary to maintain this information on another medium, in which case a program would also be needed for updating this student information file. It is not anticipated that anything more than an index file will be needed during the first year of operation.

(d) Publicizing the System. Publicity can begin midway through the development period, or some six months prior to the initial operation of the system. Advertisements will be placed in professional journals reaching students and residents, and informational materials will be mailed to medical school Deans and to Chairmen of Departments of Family and Community Medicine in all medical schools.

2. Module Operation: The module is to begin operation ten months after development

has begun, as is shown in Figure 8. Since the National Internship and Residency Matching Program has a deadline of early January for receiving student applications, it would be best if the RIM were able to begin operation by September at the latest. This would mean that development should begin some ten months earlier, or in November of the previous year. This would make the module operational at an optimal time point.

The tasks involved in the operation of the module are shown in Figure 8. Several comments about these tasks are in order.

(a) Collection of Resident Ratings. Since it is recommended that this be at the discretion of residency program directors, it may be that data cannot be obtained from all programs in the system. Nevertheless for those which do decide to participate in this phase of the module, data will be collected over a four month period. Some margin of time should perhaps be allowed for error in this estimate since residents can be notoriously busy people.

(b) Update of Program Information. Each year of operation, it is desirable to check with each residency program in the module for accuracy of the program description on file. This will involve sending program directors printed output containing the information which is stored in the file, having them verify it and correct any errors or make any changes desired, and then updating the file based on the responses. Collection of responses from programs and making the changes on the file is estimated to require six months.

(c) Processing Requests for Information. Since the module will be made available to juniors who are interested in finding out what residency opportunities exist, processing of requests is expected to occur throughout the year. It is difficult to know what the volume of requests from juniors is likely to be, and consequently no precise estimates can be made of the

the demand load on the system except to note that demand will be greatest during those months when seniors are seeking information prior to applying for residencies through the National Internship and Residency Matching Program. It is thought that the value of letting juniors use the module for exploratory purposes is great enough that the system should be available to them throughout the year, however.

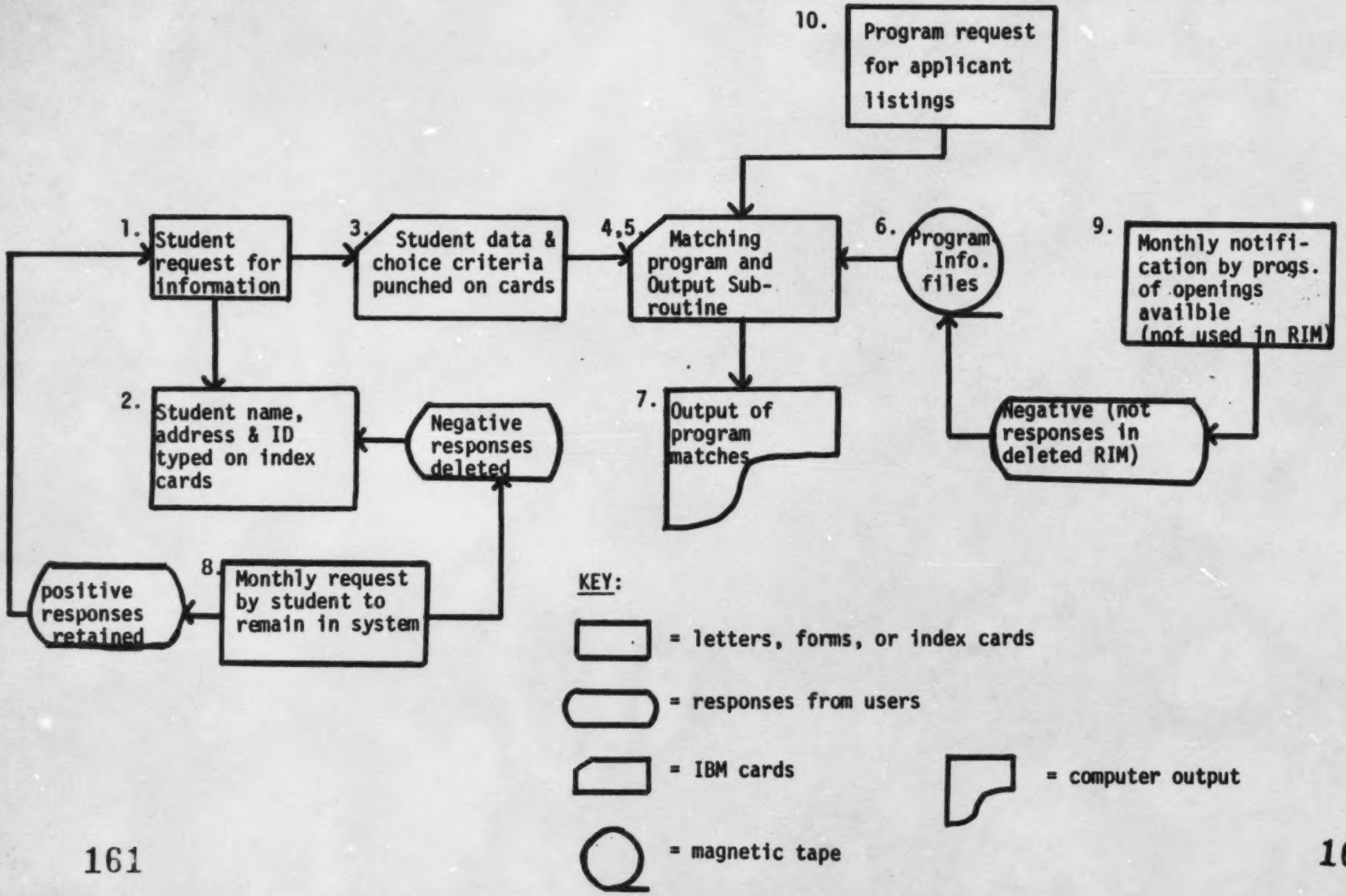
(d) Providing Programs with Reports. This task will not occur during the first year of operation since it requires collection and analysis of resident ratings. It will, however, be carried out during subsequent years. Reports will be made available to those programs from which resident ratings have been collected. An attempt will be made to make these reports fit the collective desires of participating programs insofar as this is possible. Such reports might compare each program to the aggregated data from other programs, and thus could be partially tailor-made for each program. These reports are seen as an additional incentive for programs to participate, in addition to their being able to request listings of potential applicants.

(e) Maintaining a Log of Usage Rates. This is a very desirable activity, although it is not directly related to the actual operation of the module. Such a log of usage and placement rates would be useful in evaluating the "success" of the module's operation and in determining more precisely the the user demand and cost estimates for subsequent years of operation and for other residency specialties. The log can be made a part of the computer operation in processing requests and will require a separate program for this purpose.

A more detailed illustration of the computerized operations and basic components of the RIM is given in Figure 9. These components and operations are

FIGURE 9

Computerized Operations and Basic Components of the PIM and RIM


10. Program request for applicant listings
1. Student request for information
3. Student data & choice criteria punched on cards
4,5. Matching program and Output Sub-routine
6. Program Info. files
9. Monthly notification by progs. of openings availble (not used in RIM)
2. Student name, address & ID typed on index cards
Negative responses deleted
7. Output of program matches
Negative (not responses in deleted RIM)
8. Monthly request by student to remain in system
positive responses retained
KEY:
= letters, forms, or index cards
= responses from users
= IBM cards
= computer output
= magnetic tape

virtually identical to those of the PIM. The major exception is that component number 9 is not used in the RIM. This is because of differences in the way residencies are filled as compared to preceptorships. Preceptorship programs may have slots open at various times throughout the year; there is no single point in time at which all preceptorship programs simultaneously learn which of their slots will be filled by what students. Given the National Internship and Residency Matching Program, however, the opposite is true for residencies. That is, under this program there are specified time periods during which residency programs are open for applications and others during which they are not; these time periods are the same for all programs. Because the deadline for applications is in December or early January, and because the results of the matching process are completed in March, there is simply no need for the system to have a monthly update of which programs still have openings. For practical purposes, all residency programs have openings from September until the application deadline in January.

As was mentioned earlier, the RIM could eventually reach the point where some of its clerical operations would have to be done by computer. This would happen were user demands sufficiently great to create a bottleneck in the clerical components of the system as depicted in Figure 9 (component numbers 2 and 3). In such a case, student preference information might have to be put on the tape rather than kept in an indexed file.

3. Estimated Costs. Cost estimates for the RIM alone are shown in Table 14. These costs are estimated for three years. These three years would include the following: initial development of the module for one specialty during the first year; operation of the module for one specialty and development of the information base for another primary care specialty during the second year; and operation of the module for two specialties, and development of the information base for the third specialty during the third year. Descriptions of items footnoted in Table 14 may be found at the

end of the table.

Table 15 gives the estimated costs and user fees which could be involved in making the module self-sustaining. The cost estimates assume that the module is operational and has been operating long enough to get all of the bugs worked out of it. Based on this assumption, the technical staff is no longer needed except on a consulting basis. As was the case with the PIM, the staff needed merely to continue operating the RIM is primarily clerical and administrative; technical personnel and expertise are assumed to be needed only for the first three years, during which time the data base for the module is being developed, updating procedures are being stadardized, relationships are being developed with residency programs, and standard operating procedures for servicing user requests are being established, including the outputting to programs of reports based on resident ratings.

At this point, the figures in Table 15 are only estimates, particularly the usage rates. The log mentioned above would provide more precise data on what usage rates could be expected and thus a better estimate of the degree to which the module could be self-sustaining. It should also be noted that these cost figures are for operating the module when only one primary care specialty is being serviced; costs and expected usage rates would be higher were additional specialties to be added. It is worth mentioning that some "capital investment" would be required for developing the data base needed to serve each primary care specialty; it is unlikely that the user fees collected from operating the module for one specialty could support the system and in addition finance the development of services for additional specialties.

TABLE 14

Estimated Costs for Residency Information Module (RIM)

	Year 1	Year 2	Year 3	Subtotals
I. Staff Salaries				
A. Project Director[1] (25% time)	$ 7,000.00	$ 7,560.00	$ 8,175.00	$ 22,735.00
B. Associate Director[2] (50% time)	12,500.00	13,500.00	14,600.00	40,600.00
C. Executive Secretary[3] (25% time)	2,500.00	2,700.00	2,900.00	8,100.00
D. Staff Secretary (125% in year 1; 175% in year 2; 275% in year 3)	9,750.00	14,430.00	23,400.00	47,580.00
E. Programmer[4] (10% in year 1; 20% in year 2; 20% in year 3)	1,600.00	3,460.00	3,730.00	8,790.00
F. Research Assistant[5] (20% year 1; 20% year 2; 20% year 3)	2,000.00	2,160.00	2,350.00	6,510.00
G. Fringe Benefits (15% of salaries)	5,302.50	6,571.50	8,273.25	20,147.25
SUBTOTAL	$40,652.50	$50,381.50	$63,428.25	$154,462.26

TABLE 14 (CONT.)

Estimated Costs for Residency Information Module (RIM)

	Year 1	Year 2	Year 3	Subtotals
II. Communications				
A. Postage	$ 4,800.00	$ 8,000.00	$16,800.00	$ 29,600.00
B. Printing[7]	5,000.00	8,000.00	10,000.00	23,000.00
C. Publicity[8]	3,000.00	5,000.00	7,000.00	15,000.00
D. Telephone[9]	3,000.00	6,000.00	6,000.00	15,000.00
E. Consumable Materials & Supplies	3,800.00	4,200.00	4,800.00	12,800.00
SUBTOTAL	$19,600.00	$31,200.00	$44,600.00	$ 95,400.00
III. Computer Operations				
A. CPU time[10]	$ 2,000.00	$ 6,200.00	$11,000.00	$ 19,200.00
B. Keypunching[11]	1,450.00	1,800.00	2,600.00	5,850.00
C. Cards, Tapes, & Miscellaneous	250.00	400.00	500.00	1,150.00
SUBTOTAL	$ 3,700.00	$ 8,400.00	$14,100.00	$ 26,200.00
Yearly Direct Cost Totals	$63,952.50	$89,981.50	$122,128.25	
GRAND TOTAL DIRECT COST				$276,062.25

FOOTNOTES FOR TABLE 14

1. The Project Director is a Ph.D. behavioral scientist with considerable background and experience in medical education research and specifically in the career development of physicians. His responsibility includes coordinating all of the research efforts and development of the service modules comprising the total system discussed here. His expertise in the area of physician career development provides a valuable substantive contribution to the development of the forms and the delivery of services by this module.

2. The Associate Project Director is also a Ph.D. behavioral scientist with experience in the general field of medical education and physician career development. This position requires research expertise and experience; responsibilities include developing questionnaires and forms, contacting residency program directors to secure their cooperation, supervising the development efforts of this module, and analysis of data from residents. Computer experience, at least to the extent of using packaged computer programs, is desirable.

3. The Executive Secretary is responsible for coordinating the activities of the secretarial staff for the entire project described here. Reporting to the Project Director, this person must have experience in clerical supervision and be able to coordinate work load distribution among the secretarial staff.

4. The Programmer position should be filled by someone with a degree in computing science and some experience in developing data base files.

5. The Research Assistant should have a B.A., preferably in one of the behavioral sciences. A knowledge of research methodology would also be important.

6. Postage covers initial mail contact and follow-up mailings to family and general practice residency programs, distributing to all medical schools informational materials on the service module, letters to Chairmen of Family and Community Medicine Departments, and correspondence with users. Estimated number of users is put at 5,000 the first year, 10,000 the second year, and 16,000 the third year. These user estimates assume the addition of another specialty each year.

7. Printing includes publicity material in the form of posters, brochures, etc. It also includes letterhead stationery, four sets of forms, instructions for users, and post cards for user correspondence and requests. Estimates are based on the assumption that a new specialty is added to the module each year, with numbers of users as given above in footnote 6.

FOOTNOTES FOR TABLE 14 (CONT.)

8. Publicity other than posters and brochures is referred to here; mainly advertisements placed in student and professional journals.

9. Use of WATS line for 10 hours/month @ $250/month. To be used for contacting residency programs and for toll-free student inquiries.

10. Based on rates for outside users at the University of New Mexico Computing Center. First year's usage involves testing module programs and processing 2 months of user requests. Second year's figure is for processing approximately 10,000 user requests and for updating the program information file and adding resident ratings to it.

11. Based on an estimated 300 programs to be put into the program information file; 30 cards/program. Second and third years involve adding program information for an additional specialty each year and updating roughly half of the program information already on file.

12. Includes disk pack rental if necessary, cards for running and testing computer programs, tapes for processing requests, and back-up tapes.

TABLE 15

Estimated Costs and User Fees Required for Sustaining RIM after Initial 3-year Development Period[1]

I.	Staff Salaries	
	A. Associate Director[2] (5% time)	$ 1,460.00
	B. Programmer[3] (5% time)	940.00
	C. Administrator[4]	3,600.00
	D. Staff Secretaries (200% time)	18,200.00
	E. Fringe Benefits (15% salaries)	3,630.00
	SUBTOTAL	$ 27,830.00
II.	Communications	
	A. Postage	$ 4,800.00
	B. Printing	4,000.00
	C. Publicity	2,000.00
	D. Materials & Supplies	3,000.00
	SUBTOTAL	$ 13,800.00
III.	Computer Operations	
	A. CPU Time	$ 6,200.00
	B. Keypunching	1,000.00
	C. Cards, tapes, & miscellaneous	250.00
	SUBTOTAL	$ 7,450.00
	GRAND TOTAL DIRECT COST[5]	$ 49,080.00

TABLE 15 (CONT.)

Estimated Costs and User Fees Required for Sustaining RIM after Initial 3-year Development Period

IV.	Number of Users		Approximate Fee Required to Break Even		Income
	3,400	X	$14.50	=	$49,300.00
	3,600	X	13.60	=	48,960.00
	3,800	X	12.90	=	49,020.00
	4,000	X	12.25	=	49,000.00
	4,200	X	11.70	=	49,140.00
	4,400	X	11.15	=	49,060.00
	4,600	X	10.70	=	49,220.00
	4,800	X	10.25	=	49,200.00
	5,000	X	9.80	=	49,000.00

Footnotes

1. The estimated costs and user numbers are based on the assumption that only one primary care specialty is being serviced. Were two or more specialties to be included, the costs would not necessarily be doubled, e.g., the Programmer's time would not be doubled since the programs and files needing his expertise would be the same.

2. The Associate Director's time is mainly for correspondence with persons other than student users; this might include programs or other parties who were simply interested in learning about the module.

3. The Programmer's time is mostly for trouble-shooting should the need arise, and for consultation should it become necessary to implement changes in some part of the system's operation.

4. The Administrator should be someone with a B.A. with the background and training necessary for supervising a clerical staff and for keeping the operations running smoothly.

5. These costs only cover operation of the module and do not include overhead which would be required for housing the project. Obviously the project would have to be subsidized or sponsored in this respect, otherwise these overhead costs would have to be added on to the figure given here.

F. Work Setting Information Module (WIM)

The kinds of clinical experiences which students are able to observe and in which they have opportunities to participate while in medical school are quite limited compared to the variety of professional niches which may be open to them as practicing physicians. While in medical school, students simply do not have the chance to find out what the attributes and characteristics of these niches are. What information they do obtain is very fragmented coming as it does primarily from student grapevines, informal conversations with faculty (who, being specialists, may not have experienced the wide variety of professional work situations open to physicians), and other informal, incomplete sources encountered for the most part by chance. In short, most students receive well-planned instruction in and information about the scientific bases and clinical practice of medicine, but they receive at best only haphazard information about the career alternatives open to them. Their best source of information about these alternatives comes from actually practicing in some of them, but even this is inadequate since they do not have the opportunities to explore any but a very limited range of alternatives in this manner.

The problem is basically a two-faceted one. First of all, students must begin thinking about what specialty in which to take their internship or residency before they have completed their undergraduate clinical training and hence before they have had exposure to the range of specialties they might want to consider. They do have more time to decide about practice organizations, but this "advantage" is offset

by the fact that their exposure to the range of practice models is quite limited, even by the time they have completed residency. Compounding the problem even further is their lack of exposure to or information about combinations of specialties and work settings. A third year resident considering what kind of practice model in which to begin his career may have spent a clerkship in a family practice partnership and his residency in the pediatrics ward of a county hospital, neither of which provides him with knowledge of what it is like to practice pediatrics in a mixed small group.

The WIM seeks to provide students with information about various specialty/practice organization combinations (niches) at times when they would find it useful to their career decision-making. The information to be provided, if it is to be helpful, must deal with the aspects of various niches as experienced by physicians practicing in them; consequently a survey of practicing physicians is needed. The survey of physicians in practice conducted under contract HRA #1-MI-24197 is inadequate in several ways for use in the WIM. First of all, that survey was much smaller in scope and did not result in large enough "n's" in the various specialty/work setting combinations. It is adequate for use in conjunction with the MBTI module where the information to be provided is on single specialties and specific work settings (but not on combinations of specialties and work settings). In the case of the WIM, however, it is essential to be able to give clinical year students information about the variety of ways in which one can be a pediatrician, for example, and this means that specialt//work setting combinations must be examined and described. To do this adequately means that we must have considerably more than the 470 odd cases obtained in the previous survey.

The WIM will not culminate in a computerized system from which students may request information, as is the case with three of the other service modules described in this overall system. Instead, the WIM will result in a uniquely designed booklet which will be available to students much sooner than might otherwise be possible were the information to be computerized. The possibility of eventually computerizing the WIM will be discussed later, along with the constraints which suggest that another kind of information system would be best suited to present circumstances.

1. Module Development. The essence of this module lies in the niches to be studied and their associated clinical activities, psycho-social role relationships, life style alternatives, and professional opportunity structures. The scope of niches to be included is constrained by several considerations, including the prohibitive costs involved in obtaining samples of certain niches, and the scarcity of other types of niches. Furthermore, the module is designed for undergraduates, and information about various sub-specialties would perhaps not be as relevant for them as would more general types of niches. Finally, since the module is aimed at providing information for a fairly broad spectrum of students, it should focus on those kinds of career alternatives which are most apt to be considered by those students. Thus, for example, the module would not include information about the niche occupied by an endocrinologist doing full-time basic research in a university medical center.

   Given these general constraints, the sample may at this point tentatively be described as covering some ten specialties, including general and family practice, general internal medicine, ob-gyn, pedicatrics, general

surgery, psychiatry, pathology, anesthesiology, and radiology. Obviously one could debate the merits or shortcomings of any such list, but in the end it would simply resolve to a matter of which perspective or emphasis one chose to utilize. The rationale used as the basis for including these specialties involves several considerations: (a) since the tracking system includes students who may not be interested in primary care, the module should offer some information appropriate for students who are not interested in these specialties; (b) for those students who are undecided about primary care, the list should include specialties which contrast significantly with primary care specialties in important ways, such as amount of contact with patients; and (c) the costs of obtaining adequate samples should not be prohibitive, and hence the non-primary care specialties in the list should be those which occur with high frequency in this country.

Equally important to career decision-making are work settings in which physicians may practice. Nine of these have been tentatively selected for inclusion in the WIM: solo practice; partnerships; small group, same specialty; small group, mixed specialty; hospital based large groups, e.g., HMO's; city and county hospitals; state hospitals; non-research positions in the PHS; and innovative primary care team, self-sustaining practice models in rural or shortage areas.

Given these specialties and work settings, it is desirable to examine as many specialty/work setting combinations as possible. Some combinations, of course, may not occur with sufficient frequency, e.g., psychiatrists practicing in small mixed groups. For those which do occur sufficiently often, however, it is necessary for statistical purposes

to have approximately 100 cases from each combination. This results in a desired sample size of 7,500 cases. This is the sample size goal; obviously it will be necessary to contact a greater number of physicians than this initially.

Selection criteria for the sample are based on a number of considerations. First of all, it would be too costly to attempt to obtain completely or even approximately random samples of physicians in the specialty/setting combinations produced by the two lists above. Second, it is also too costly to sample individual physicians in the first stage. It is much more economical to sample work settings in the first stage, i.e., to identify specific clinics, hospitals, etc. first and then to study individual physicians working in them. For solo practices, obviously this strategy cannot apply, but a variation of it can. In the case of solo or small groups practices, the analogous tactic is to identify certain geographic, political, or physical boundaries in the first stage, and then to study the physicians occupying those areas selected.

Given the limits placed on the study by cost constraints, a concerted effort must be made to include in the sample physicians and specific work settings which are as representative as possible of the niches being studied. This can be accomplished by obtaining in the first stage a sample of specific work settings exhibiting a wide range of variation on a few theoretically significant factors, such as geographic area.

For some purposes the sampling strategy described above would be totally inadequate. Sampling strategies are not absolutes, however, but are dictated by the goals of the research. Since in this case our purpose is to generate data descriptive of selected medical career niches, it is not necessary that the sample be representative in a random sense

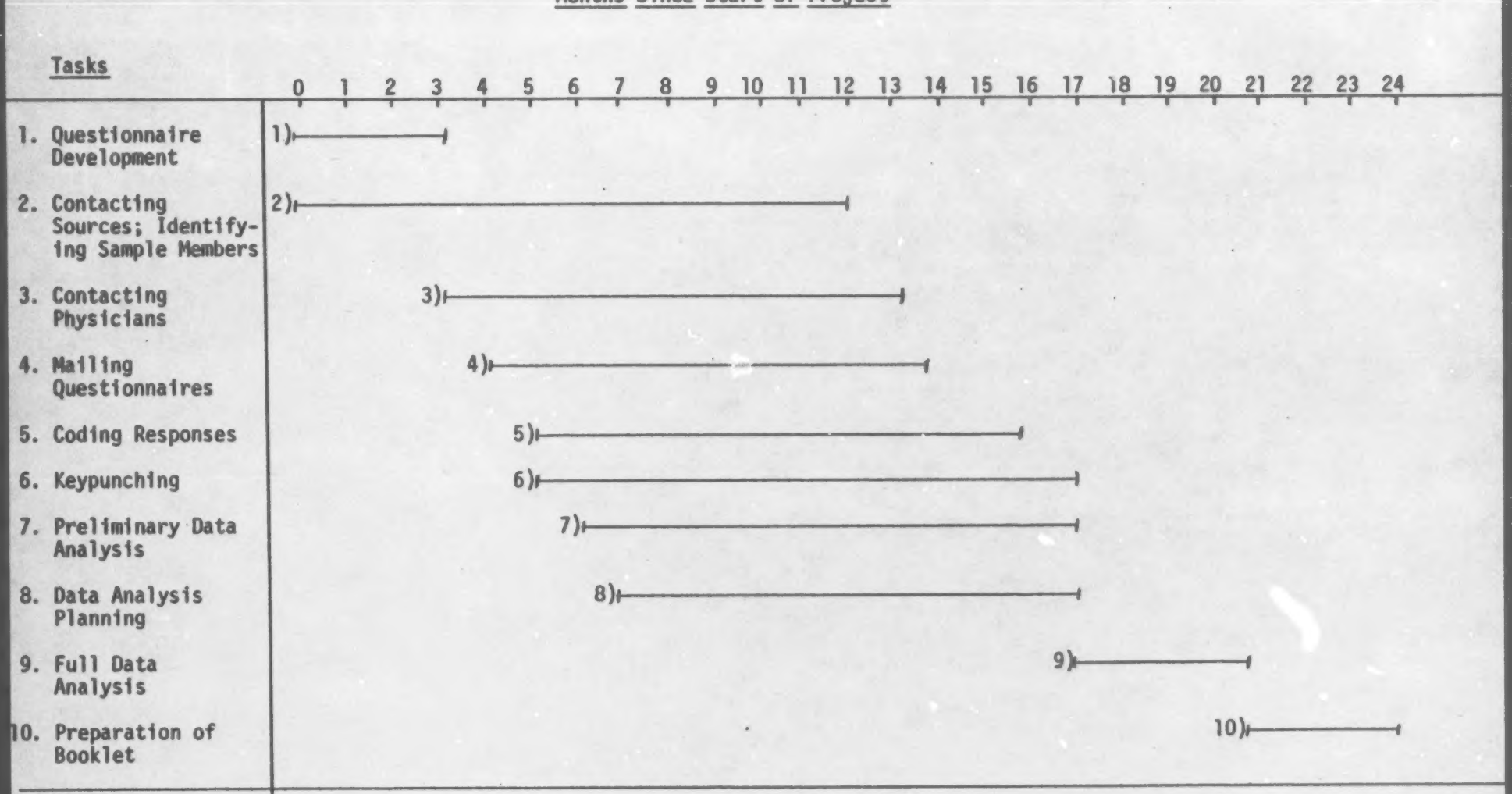
of all physicians in a given specialty or in a given type of work setting. It is sufficient that our sample generate data which will give students information about the kind and range of variations which exist in the career niches about which they must eventually make choices.

A time and task chart for the development of the WIM is given in Figure 10. It is anticipated that the entire development effort of collecting information from physicians and putting it into a useable form for students will take two years. The remaining sampling considerations and other strategies for developing this module will be discussed in connection with the tasks listed in Figure 10.

(a) Questionnaire Development. In order to be of help to students, the module must bring together in a coherent form information which (1) is not otherwise available to students, and which (2) gives images of what practicing in various niches is like. The questionnaire to be developed will include but not be limited to such things as: hours worked per day; supervision of subordinates (number supervised and percent of time devoted to supervision); number of nights on call; amount of patient contact; degree of autonomy; life style alternatives; amount of free time for other interests; degree of intellectual stimulation; ability to control hours; and other important practice characteristics.

The time required for development of this questionnaire is only three months, primarily because it can be a revised version of the questionnaire used in the physician survey mentioned previously. One of the major problems in developing such a questionnaire is to write items which can be answered by physicians working in a variety

Time and Task Chart for the Development of the Work Setting Information Module (WIM)


Months Since Start of Project
Tasks
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
1. Questionnaire Development
2. Contacting Sources; Identifying Sample Members
3. Contacting Physicians
4. Mailing Questionnaires
5. Coding Responses
6. Keypunching
7. Preliminary Data Analysis
8. Data Analysis Planning
9. Full Data Analysis
10. Preparation of Booklet

of specialties and work settings (and thus be used for comparing diverse niches) and which will at the same time differentiate among niches. Experience with the earlier physician work setting instrument is invaluable in this regard, both with respect to selecting optimum items and keeping the instrument short enough that its length will not reduce the response rate.

(b) Contacting Sources; Identifying Sample Members. As mentioned above, the first stage of the sampling process will be aimed at selecting work setting units from which individual physicians may be sampled in the second stage. There are several approaches to the process of selecting a sample, some of which are considerably better than others in terms of time, cost, and effort. In the physician survey mentioned earlier (performed under contract HRA #1-MI-24197) an AMA tape listing names and addresses of physicians, their specialties, work settings, etc. was used. The shortcomings of such a source were the bane of the previous survey and are such as to make it completely inappropriate for the WIM survey. First of all, the specialty, work setting, and community size information on the tape were frequently in error because they were out of date. Second, such tapes lack some of the work setting categories which are to be studied for the WIM. Third, such a source does not yield the kind of liaison between the project staff and the physician which is essential to the success of such a study.

Declining the use of a single source in favor of utilizing several different sources offers many advantages. First of all, different niches may be more accessible through some sources than others, and

the latter approach permits the researcher to select for each niche that source which is most likely to yield the number and kinds of physician contacts desired. Second, the latter approach leaves the researcher with some degree of flexibility. That is, if one source is not as effective in generating contacts as was hoped, others can be used. Third, sources which are closer to the physicians contacted (e.g., specialty societies or state medical societies) are (1) likely to have more up-to-date information than sources such as the AMA tape, and (2) likely to provide a better liaison between research staff and physicians. The AMA tape in effect provides no aegis under which physicians could be contacted.

Thus, the sources to be used in this survey will be many and varied. They will include state medical societies, specialty societies, the PHS, and in some cases specific large group practices. This last and similar sources may be necessary for obtaining physicians who are practicing in innovative health care delivery models. These types of sources will be contacted in person for the purpose of obtaining their cooperation and advocacy as well as names, addresses and other pertinent information necessary for selecting individual physicians to be included in the sample. Such personal contact with these sources is essential for the success of the survey. Previous experience in conducting a survey of physicians in New Mexico with the cooperation of that state's medical society showed that a response rate of 89% could be obtained. This compares with a response rate in the neighborhood of 40% from physicians whose names were obtained from the AMA tape and who were contacted without going through any professional societies. Some surveys conducted by the AMA itself have yielded response rates of only around 60%.

(c) Contacting Physicians. Once individual physicians have been identified who occupy the niches we wish to include in the WIM, they will be contacted by mail in most instances, although in some cases (such as innovative model practices) they may be contacted in person. The initial mail contact will explain the purpose of the survey, inform the physician of the study's liaison with the professional society or group through which his name was obtained, and ask for his cooperation in participating in the survey. This type of initial contact with physicians is important as a first step for several reasons. First of all, it eliminates the time and expense involved in sending out survey materials to large numbers of people, many of whom may not respond. Second, it gives the researcher early in the sampling process some notion of what the response rates will be. If it appears that these rates are lower than anticipated for some niches or combinations of specialties and work settings, then steps can be taken to obtain more physicians in these niches. Third, it alerts those physicians who agree to participate that the survey materials will be coming to them in the mail.

The time span for contacting physicians is shown in Figure 10 as covering ten months. This is partly to allow time for questionnaires to come in, and partly because the entire sample of physicians to be contacted will not be known all at once. Since several sources are being used to obtain names of physicians, it is anticipated that lists of names will become available at different times.

(d) Mailing Questionnaires. This task is also affected by the fact that names of physicians will become available at different times, and as a consequence some twelve months have been allowed for it. Mailing

of questionnaires can begin as soon as positive responses begin to come in from the initial contacts with physicians.

(e) Coding Responses. Due to the nature of some of the items which may be used on the work setting instrument, it will not be possible to use an entirely pre-coded form which can be given directly to keypunchers. Some responses will have to be coded by hand. Coding can begin as soon as questionnaires begin to come in and will continue for some two months after the last questionnaires have been sent out. Obviously, given the number of respondents desired and the necessity of completing the WIM within two years, it will be necessary to schedule the contacts with professional societies and organizations and the mailing of questionnaires in such a manner that the niches and work settings with larger numbers of physicians are dealt with first. Smaller niches and practice organizations, such as innovative rural practice models, can be contacted later.

(f) Keypunching. This task may begin when incoming questionnaires have been coded. It will continue for approximately a month after the last questionnaires have been received. From previous experience, questionnaires may trickle in for a long period, but it is necessary to specify some cut-off date after which questionnaires which may come in will not be included in the final data set. The physician survey done previously found that one questionnaire was returned some two years after it was sent out!

(g) Preliminary Data Analysis. Given the time constraint for finishing the WIM, it is necessary to begin preparations for the data analysis which will be done after collection of data has been completed. Shortly after the sets of returns have been keypunched, it should be

possible to begin looking at some of the results for particular niches. This is another advantage of contacting professional organizations and niches sequentially: such preliminary analyses can begin early without having to wait for the entire set of data to come in from all niches. These early analyses are necessary for determining significant and/or unanticipated trends in the data which can be explored in more depth later and which might otherwise be missed were analysis to be delayed until all of the data are in.

(h) Data Analysis Planning. Based on the results of the preliminary data analyses, plans can be made ahead of time for analyzing the full set of data. With as many cases as are anticipated for this survey, it will save significant amounts of time near the end of the study if preparations are made for the final analyses before these analyses are begun. Such preparations include determining what statistical procedures are to be run and what transformations or operations on different variables are to be done. The necessary programming which must be done even with canned statistical packages can also be prepared ahead of time.

(i) Full Data Analysis. The main function of the WIM -- to provide students with information about various career niches confronting them -- does not necessitate the use of complex multivariate statistics. The analyses to be performed are primarily descriptive, but even here careful consideration must be given to just which descriptive statistics will be most informative. Frequency distributions, averages, and ranges may each be appropriate in certain instances but not others, while some cases may require that a combination of statistics be used. At any rate, analyses involving

the entire data set require that a file be constructed and prepared for input to statistical programs or canned statistical packages. SPSS would appear to be a good candidate among the latter.

It should be pointed out that even though much of the output of the WIM will be descriptive statistics, there are other types of analyses which could give students valuable insights into the natures of various niches. While these analyses do not involve higher order multivariate statistics, there may be some relationships among variables which are worth examining. Students might be interested, for example, in knowing the comparative degrees of autonomy in a small group mixed practice and a large group, or in the degree to which autonomy and intellectual stimulation are associated in different niches. Such descriptions of the associations and relationships among variables could give students insights into the kinds of trade-offs they will have to confront in choosing among niches. These insights are not likely to be of the immediately obvious type which could be determined by inspecting merely descriptive statistics; nor are they likely to be the kind of information one could obtain even by first hand experience in one or two niches.

Analysis of the full set of data is estimated to take four months. This estimate assumes that some preliminary analyses have been run and that plans have been developed and programming developed prior to the final analyses. Figure 10 makes this assumption also.

(j) Preparation of Booklet. This task is estimated to require three months. The narrative requirements of the booklet are fairly small and consist primarily of: directions for using the book; definitions

and examples showing how the statistics presented should be interpreted; a general description of what the booklet does and does not cover; a description of the sample and how the data were obtained; and miscellaneous notes and comments needed to clarify or interpret data presented.

The remainder of the booklet will be comprised of information about various niches. This information will consist of descriptive figures and statistics, but this will not be presented in the form of table after table of numbers (see part 2 below for a discussion of the format of the booklet). Nevertheless, part of the preparation effort involves compiling figures and statistics and formatting them in ways that are appropriate to the intent of the booklet as an information system. The preparation effort should be finished at the end of the two year development period. While the booklet may not necessarily be out in print by the 24th month, it should have been sent to the printer by that time.

2. The Booklet: An Information System. All of the modules described here are information service systems, and three of them are computerized. Their main function is to provide students with information about themselves or career alternatives at appropriate times. The forms which these information systems take are a function of several factors, and it should be emphasized that a primary concern is making the right kind of information available at the right time to students. This may or may not mean a computerized system. The WIM could be computerized. This possibility and the reason for not doing so will be discussed later at length; for

the moment we merely note that development time is one of the main reasons for putting the WIM in booklet form.

It is one of the intentions of the WIM to provide students with information about niches, i.e., combinations of specialties and work settings. There are many different ways of being a pediatrician in the sense that there are many different settings in which one may practice pediatrics. Moreover, there are many different things one can do after specializing in pediatrics which do not involve direct patient care at all. In short, giving students some idea of what the practice of pediatrics involves in terms of patient care activities is not enough. The career choices facing students are comprised of many other components. Only by providing information about the ways in which these components may be combined can we give students some notion of the variety of ways in which one may be a pediatrician, a general surgeon, or any of the other specialties comprised in the WIM.

In addition, there are many different kinds of students, and therefore many different ways of inquiring about career alternatives. The implication, of course, is that different students may wish to approach the task of finding out about career niches in different ways. The WIM should make it possible for these various kinds of students to approach the matter in whatever way suits them best. As a secondary function, the WIM may go even further and stimulate students to think about their career choices in ways which might not have occurred to them previously.

The structuring of the information presented in the WIM is determined in part by the kinds of information which will be available. There are three basic informational components: specialties, work settings, and professional activity characteristics. Consequently, information about

niches may be approached from three basic perspectives. Each of these perspectives starts with one of the components and from there leads to an investigation of the associations it has with the other two components. Thus, a student may wish to:

(a) specify the specialty he is interested in and subsequently ask what the general characteristics of that specialty are and what work settings are possible given that one wishes to be that kind of specialist;

(b) specify the work setting he is interested in, and subsequently ask what specialties are found in that work setting and what the characteristics associated with it are; and,

(c) specify the practice characteristics he prefers, and subsequently ask what specialties and work settings possess those characteristics.

In addition to looking at single components, students may also want to look at combinations of components and asks what niche aspects are associated with them. In this case, there are three additional starting points for investigating career niches, and a student may wish to:

(d) specify the specialty/work setting combination he is interested in and ask what characteristics are associated with it;

(e) specify the specialty/practice characteristics combination he is interested in and ask what work settings offer that combination;

(f) specify the work setting/practice characteristics combination he wants and ask what specialties are associated with it.

The usefulness of any information package is determined by the relevance of the information and the ease with which it can be accessed. Assuming the information in the WIM is relevant to his needs, a student

should be able to locate the specific kinds of information he wants without having to read through the entire booklet. In other words, given a student who is approaching his investigation of niches from one of these perspectives, it should be possible to direct him to that section of the booklet dealing specifically with his interests. While the booklet's organization cannot be spelled out in detail here, it is possible to describe briefly what the organizational structure will be like. Given the six different ways of inquiring about career niches listed above, there should be six different sections in the booklet corresponding to the types of questions which may be asked by the student. The descriptions presented below are merely examples of the type of information which will be available in the booklet.

The first section will describe each specialty in terms of (1) the general activities and characteristics associated with that specialty, and (2) the work settings in which it is possible to practice that specialty. Thus, a student interested in finding out about psychiatry could turn to the first section of the booklet and find there, for example, information about (1) the relative degree of autonomy of psychiatrists as compared to other specialists, the relative number of patients seen per day by psychiatrists as compared to, say general internists, and the relative frequency of consultation with other physicians by psychiatrists as compared to other specialists; and (2) the most frequent work setting in which psychiatrists are found, the relative proportion of psychiatrists in state hospitals as compared to the proportion of general surgeons, and the relative proportion of psychiatrists in solo practice as compared to partnerships.

The second section will describe various work settings in terms of the specialists found in those settings, and in terms of the characteristics associated with those settings. Thus, a student interested in learning something about mixed small group practice could turn to this section and find, for example, information about (1) the frequency with which various specialists are found working in such a setting (e.g., whether there are proportionately fewer pediatricians than general surgeons in mixed small groups), and (2) the number of nights on call in a mixed small group setting as compared to a state hospital, the degree of intellectual stimulation in a mixed small group as compared to solo practice, or the amount of free time for pursuing outside interests when practicing in a mixed small group as compared to solo practice.

The third section will list the characteristics and activities which may be associated with various niches and for each such characteristic or activity, describe such things as (1) the relative frequencies with which various specialties exhibit that activity, e.g., how often general internists have to interpret lab tests results as compared to pediatricians; and (2) the degree to which each characteristic is associated with different work settings, e.g., the relative amount of time spent dealing with emergency medical problems, performing habitual or nonvarying medical activities, or advising or counseling patients and/or their families in a state hospital compared to solo practice.

Obviously some of the information presented in each of these three sections is duplicated in one or both of the other sections. The form in which it is presented in each section is different, however, and at any rate the important factor is not to avoid duplication across sections,

but rather to present the information in formats which are most directly relevant to the ways in which students may wish to ask questions about career alternatives. The data and information presented in the three sections described above is obviously to be aggregated, i.e., information about a given specialty is based on data across all work settings, and thus the number of hours of patient contact shown for general surgery in section one would combine data from mixed group practice settings, state hospitals, solo practice settings, etc. While such information is useful for answering certain types of questions, it does not give students the kind of detailed picture of specific niches which they may be interested in, e.g., solo practice in general surgery. Consequently, there will be three additional sections which will present more detailed information than was presented in the first sections.

The fourth section will give students detailed information about specific specialty/work setting combinations and the activities and characteristics associated with each. Thus, a student wishing to know some of the characteristics of solo practice in internal medicine, for example, could turn to this section and find out how that niche compares to the "internist in a state hospital" niche with respect to such things as degree of autonomy, amount of intellectual stimulation, cost constraints on provision of care to patients, or degree to which doubts, frustrations or problems can be shared with colleagues.

The fifth section will deal with specialty/practice characteristics combinations, and the work settings that are associated with each such combination. A student wishing to know what work settings are available to internists who desire intellectual stimulation from interaction with

colleagues may turn to this section and perhaps find that such a combination is more likely to occur in a mixed small group setting than in a state hospital, for example. In short, this section will best serve those students who may have tentatively decided on a specialty and know what activities and satisfactions they seek, but do not know what work settings will offer them what they are looking for.

Section six will identify various work setting/practice characteristics combinations and provide information on what specialties are to be found in those combinations. A student who is interested in working in an institutional setting and who wants regular hours and sufficient free time for other interests could turn to this section and find out what specialties would offer the greatest opportunity for entering such a niche. This type of question is not at all peculiar or unlikely, and in fact it is the kind of perspective one might expect from a female student attempting to combine a career in medicine with family responsibilities.

From these brief descriptions of what the organizational structure of the booklet might be like, it is apparent that all of the sections described would make important contributions to the goal of providing students with information about career niches. It seems quite likely that the first three sections may stimulate students to explore certain niches in more depth as they are described in the last three sections. Thus, besides giving students information they now lack in an easily accessible form, the booklet may induce them to explore some career alternatives they might not otherwise have investigated.

It is worth noting at this point that the AMA has recently begun putting out a booklet, "Profile of Medical Practice" which presents various

types of statistics on specialties and work settings. These data are not at the level of detail with respect either to the items included or with respect to the niches described as would be the case with data in the WIM booklet. The most specific, detailed items in the AMA publication are limited to the following: average hours practiced per week, average hours spent in the office, in the operating or delivery room, or average hours spent making hospital rounds, house calls, or doing administrative business, all of which are broken down by specialty. These items are the greatest detail at which information is presented in the AMA booklet, and it is apparent that such items, while perhaps useful for some purposes, are not the kind of information which is likely to give students any notion of the qualitative differences in daily activities across specialty/work setting combinations or of the quantitative differences across niches with respect to numerous other characteristics which would be more relevant for making career decisions.

The WIM is not a duplication of the AMA effort; it is designed to present information which is not available from any other sources. It would use a revised version of the questionnaire employed in the survey of physicians in practice mentioned earlier. As one physician respondent in that study put it, "No one ever asked me these kinds of questions before." Yet that study found that it was precisely those "different" kinds of questions which turned out to be significant in identifying differential sources of professional and personal satisfaction among the physicians and niches surveyed, and it is quite likely that the data obtained from such questions would be invaluable in helping students who are trying to make career decisions.

3. Booklet versus Computer Information System. As mentioned earlier, it might be possible to put information about career niches on a computer file. As presently envisioned, such a system would require an on-line file with which students could interact at a remote terminal. The nature of the interaction could be determined by the program written to operate such a system. In some cases, the system could ask students questions and, based on their answers, provide them with certain sequences of information which could either narrow the focus of the information presented (e.g., from primary care to solo practice in ob-gyn) or broaden the focus (e.g., from radiology in a state hospital to data about non-primary care specialties across all work settings), whichever was determined appropriate by the students' responses. In other cases, students could ask the system questions and explore the information in whatever manner they chose (subject to programming constraints). Such a system could be made available as a packaged product which could be sold at cost or distributed to any medical school which wished to have it. All that would be required would be an on-line storage facility and a remote terminal from which the file could be accessed.

There are several problems with a computerized version of the WIM which make that path a less desirable one. First of all, it requires nearly two years from beginning of data collection to the final data analysis, and that is only to bring the module to the point at which it could begin to be computerized. Second, it would require considerable additional time to write the programs for putting the data in an on-line file and for interacting with the file. Third, it

would require additional time for contacting medical schools and demonstrating the system to them. Fourth, once the system had been installed at a given medical school, it would require some means of instructing students in the use of the package. This would mean some kind of manual showing how to operate a remote terminal and how to converse with the computer in whatever language was necessary for accessing and interacting with the file. In addition to the extra expense beyond the costs estimated in Table 16 for the booklet version, the extra time required would be significant. It might take six extra months just to get the computer version of the module operational at the school or institution where it originated; making it available to other schools and getting it operational other places would require perhaps an additional year -- less if money and facilities were readily available at each school, and more if (as is most likely the case) money and facilities were not readily available at each school. In short, a conservative estimate is that three and a half years would be required before the module would be available at most schools and to most medical students if it were to be made into a computer system rather than a booklet.

4. Estimated Costs. Table 16 shows the estimated costs for collecting the data needed for the WIM and for preparing the booklet and distributing it. These cost estimates assume that the times in Figure 10 are accurate, i.e., that the data can be collected and analyzed within two years. The costs for the third year are mainly for distributing the booklet; it is assumed that the booklet would be requested by and made available to other students besides those in the tracking system.

TABLE 16

Estimated Costs for Work Setting Information Module (WIM)

	Year 1	Year 2	Year 3	Subtotal
I. Staff Salaries				
A. Project Director[1] (12½% in yr. 1; 25% in yr. 2)	$3,500.00	$7,560.00	0.00	$11,060.00
B. Associate Project Director[2] (100% yrs. 1 & 2; 5% yr. 3)	25,000.00	27,000.00	1,460.00	53,460.00
C. Programmer[3] (40% yr.2)	0.00	6,900.00	0.00	6,900.00
D. Executive Secretary (20% yr. 1; 25% yr. 2)	2,000.00	2,700.00	0.00	4,700.00
E. Staff Secretary (50% yrs. 1 & 2; 100% yr.3)	3,900.00	4,200.00	9,100.00	17,200.00
F. Research Assistant[4] (100% yrs. 1 & 2)	10,000.00	10,800.00	0.00	20,800.00
G. Fringe Benefits (15% of salaries)	6,660.00	8,875.00	1,585.00	17,120.00
Subtotal	$51,060.00	$68,035.00	$12,145.00	$131,240.00

TABLE 16 (Cont'd)

	Year 1	Year 2	Year 3	Subtotal
II. Communications				
A. Postage[5]	$3,900.00	$ 975.00	$1,800.00	$6,675.00
B. Printing[6]	1,000.00	15,000.00	0.00	16,000.00
C. Telephone[7]	3,000.00	2,000.00	0.00	5,000.00
D. Materials & Supplies[8]	1,000.00	500.00	600.00	2,100.00
Subtotal	8,900.00	18,475.00	2,400.00	29,775.00
III. Computer Operations				
A. CPU Time[9]	3,100.00	3,100.00	0.00	6,200.00
B. Keypunching[10]	1,500.00	1,900.00	0.00	3,400.00
C. Cards, Tapes, Misc.[11]	200.00	200.00	0.00	400.00
Subtotal	4,800.00	5,200.00	0.00	10,000.00
IV. Travel[12] (6 trips; 1 person/trip @ $350/trip)	2,100.00	0.00	0.00	2,100.00
Yearly Direct Cost Subtotals	$66,860.00	$91,710.00	$14,545.00	
GRAND TOTAL DIRECT COST				$173,115.00

FOOTNOTES FOR TABLE 16

1. The Project Director is a Ph.D. behavioral scientist with considerable background and experience in medical education research and specifically in career development of physicians. His responsibility includes coordinating all of the research endeavors and service modules comprised in the total system discussed here. The percentages of time for this module reflect his greater involvement in the analysis and interpretation of data during the second year.

2. The Associate Project Director is also a Ph.D. behavioral scientist with experience in the general field of medical education and physician career development. Major responsibilities relative to this module include developing the sample of physicians, making the necessary contacts with medical societies and clinics, developing the work setting questionnaire, analyzing the data, and developing the booklet mentioned in the description of this module.

3. The Programmer should have a degree in computer science and several years experience in working and developing data base systems.

4. The Research Assistant should have a B. A., preferably in one of the behavioral sciences. Course work should include at least one statistics course and one course in research methodology in the behavioral sciences.

5. The first year's figure covers an initial contact mailing to 10,000 physicians at bulk rates, return post cards, a second mailing to responding physicians of questionnaire materials at bulk rates with first class return postage, and general correspondence with state medical and specialty societies. The second year's figure includes general correspondence and postage for late responders. Postage for the third year includes bulk rate mailing of 20,000 booklets to medical students and other interested parties.

6. Printing covers the work setting questionnaire for the first year (10,000 copies) and 20,000 copies of the booklet during the second year.

7. Telephone services include a WATS line during the first year at $250/month for 10 hours per month. This service is needed to cover communication with the various societies and medical groups needed for obtaining the sample.

8. These figures include general consumable office supplies and xeroxing, envelopes for mailing, etc.

FOOTNOTES FOR TABLE 16 (Cont'd)

9. These figures are based on the rates for outside users at the University of New Mexico Computing Center. Rates at other installations may vary. Provision has been made for 10 hours of computer time per year.

10. An estimated 3 cards per case, computed for 7,500 cases @ $.15/card for punching from pre-coded questionnaires. The total amount is divided between years 1 and 2.

11. This item includes cards for running numerous jobs, tapes for storing data files, possible disk pack rental, and locker facilities at the computing center if available.

12. An estimated 6 trips for meeting with state medical and specialty society personnel and with clinic staffs where necessary. Trips are for the purpose of securing the cooperation and assistance of these groups in contacting potential sample physicians.

G. System for Physician and Community Contact (SPACC)

The SPACC is the third and last computerized service module. It is last in the sense that in most cases it will be the final service module which a student going through the tracking system would use. Like the RIM and the PIM, the SPACC is not necessarily limited to students in the tracking system, although it does function as an incentive or a benefit available to those students who remain in the tracking system. The module will be used primarily by students finishing the third year of primary care residencies, although for students who do not take residencies, it may be of use after graduation or internship. Unlike the other computerized systems, this module serves three categories of users rather than just two: communities seeking physicians; physicians seeking locations for establishing practices; and physicians who are seeking to contact potential partners for team or group health care delivery models. The module's functions correspond to its services to these three user groups:

(a) It provides physicians who are seeking potential practice locations with information concerning communities which need physicians and which (within certain constraints) satisfy their preferences regarding specified characteristics;

(b) It provides communities needing medical care services the opportunity to contact physicians whose expressed preferences match those of the community;

(c) It provides physicians who are seeking partners with an opportunity to contact other physicians having similar or compatible expressed interests in terms of practice model, geographic location, etc.;

(d) As with the other service modules, it provides some incentive for students to remain in the tracking system.

The scope of the module is constrained in several ways. First of all, it will initially focus on a fairly limited region in which there is a shortage of physicians, such as the southwest. The communities in the system will be those within the specified region which are currently experiencing inadequate health care delivery. Thus, within the southwestern region, large cities such as Albuquerque or Tucson would not be included, but smaller towns lacking physicians would be contacted and given an opportunity to enter the system. Second, the module will be national in scope in that it will be available to physicians throughout the country, and attempts will be made to give the module national publicity in order to attract physician users from as broad a base as possible. Third, due to the nature of the communities which will be included in the system, the module will be able to meet the needs of only a fairly restricted range of specialists. Family practitioners, general internists, general surgeons, and the like would find the module useful, whereas endocrinologists and neurosurgeons would not. In short, the module is oriented towards increasing primary care delivery in shortage areas by providing a means whereby physicians and communities can get in touch with each other.

This orientation provides a clue as to the module's uniqueness among placement services, of which there are many already in existence. The AMA placement service is national in scope and is not focused on any particular type of community or region; it includes large cities and all types of specialties. Consequently, it is not apt to include communities in shortage areas which are not visible to the medical community and which may not know how to go about making themselves either visible or attractive to physicians. While the AMA placement service does have liaisons with state medical societies and their placement services, it is often the case that these state societies operate merely as clearinghouses. The New Mexico State Medical Society's

placement service makes no effort to contact communities, for example. Communities enter the system only on their own initiative. Furthermore, the system is not computerized and no active attempt is made to reach physicians on a national scale, except through liaison with the AMA placement service. This latter liaison is not individualized in the sense of matching individual physician with communities; rather, names of physicians who have indicated that they may be interested in the southwest region are made available to the New Mexico placement service only if those physicians have specified that their names may be released by the AMA service.

The SPACC, on the other hand, goes much further than these services in what it attempts. It makes an active effort to contact communities, it is aimed at communities in shortage areas, and its focus is on primary care specialists. In other words, the module described here is primarily aimed at placing primary care physicians in shortage areas rather than at providing placement services for a broad range of specialists seeking a wide variety of settings. One of the assumptions behind the module's effort is that the types of idealistic young physicians who may be willing and eager to offer their services where they are badly needed are not necessarily those who have joined the AMA. While no figures can be quoted here on the percentage of recent medical school graduates who join the AMA, it is worth noting that the AMA's membership has fallen to around 50% of this country's physicians in the past few years. There are also reasons to believe that an active approach is more appropriate for a placement service focusing on shortage areas than the "clearinghouse" or more passive placement service approaches undertaken by state medical societies and the AMA. Physicians seeking practices, positions, or partners often learn of them through professional media or through

informal grapevines, but those areas lacking physicians are obviously excluded from informal grapevines and are not likely to be found advertising in the professional media reaching physicians. Nor are these areas likely to have the knowledge or contacts necessary for presenting their communities in an appealing manner or for making the most of the placement services presently in operation. The SPACC is an attempt to acknowledge the peculiar circumstances and needs of underserved areas and to adapt the placement service approach to the unique situation of these areas.

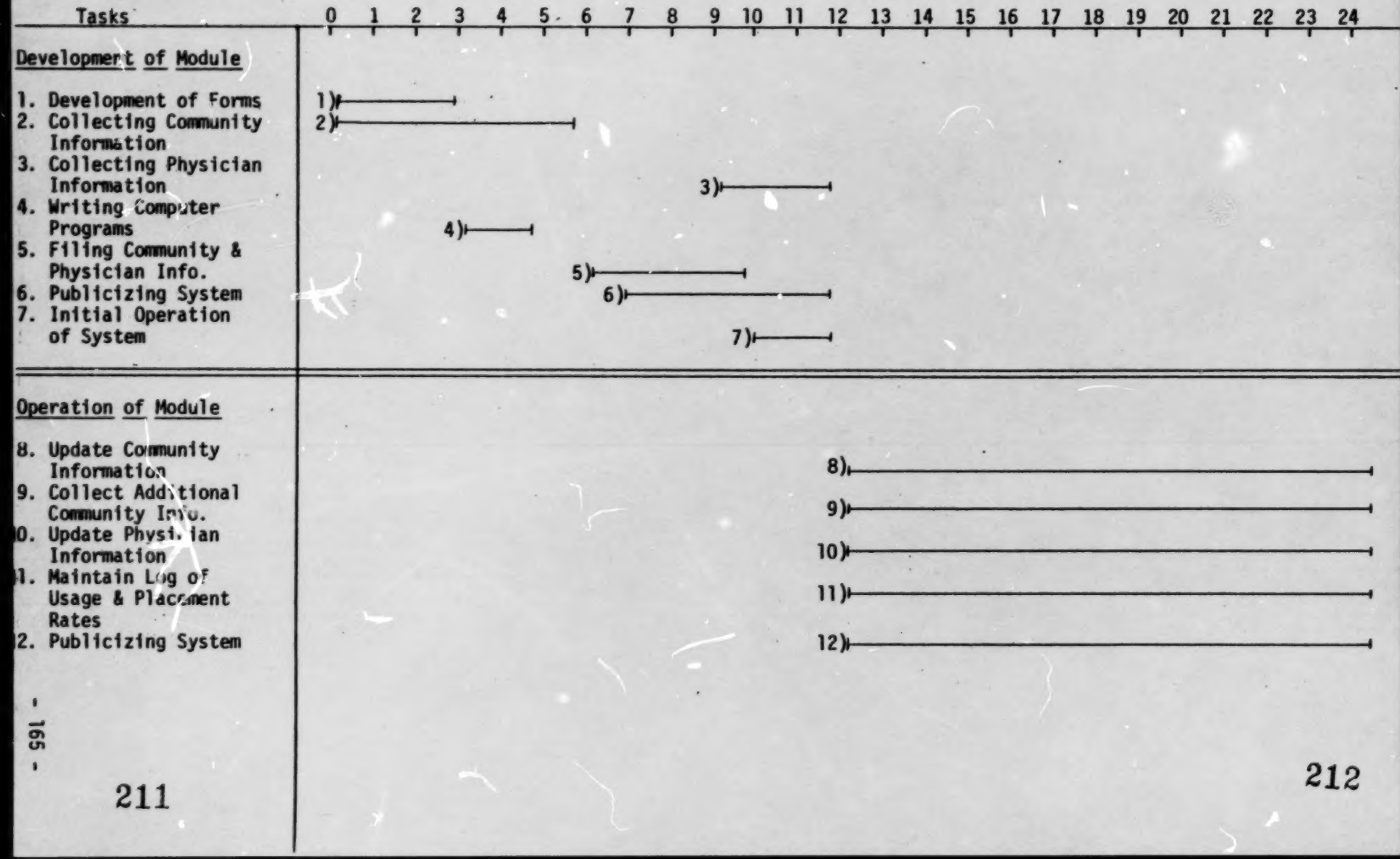
The SPACC also goes a step further on the physician's side of the placement process in that it offers a means whereby physicians may contact other physicians for the purpose of obtaining partners or associates. This type of service is seen as an important element since (a) many students who have been involved in primary care preceptorships together have often times expressed a desire for some means of contacting each other after the completion of their training for purposes of setting up practices together; and (b) the prospects of setting up practice in a shortage area are likely to be more attractive when there is the possibility of sharing the risks and responsibilities with another physician. The focus of this particular service in the SPACC would be on physicians who are interested in primary care in rural or shortage areas.

1. Module Development. A time and task chart for the development and operation of the SPACC is shown in Figure 11. The chart covers only two years, including the 10 months for development and the first 14 months of operation. Subsequent years of operation would be duplications of the second year as shown in Figure 11. These tasks will be described here briefly.

   (a) Development of Forms. There are three basic forms to be used in the SPACC's operation: the community information form; the physician pre-

Time and Task Chart for the Development and Operation of the System for Physician and Community Contact (SPACC)

Months Since Start of Project



ference form; and the notice of desire to remain in the system.

(i) The community information form will be used to collect information about each community which participates in the system. Included will be information about such things as population, distance to the nearest hospital or lab, schools, distance to nearest metropolitan area, climate, and major recreational activities. Some, but not all, of the data collected will be used as a basis for matching against criteria specified by physicians. The form will also permit each community to write a brief narrative description of the community and its positive assets. This narrative description will be printed out whenever the community is matched with a physician's criteria.

(ii) The physician preference form will in effect be two forms in one. It will permit a physician to specify his preferences regarding either community characteristics or partner/associate interests and training, or both. For example, a physician may specify that he is interested in communities in northern New Mexico or southern Colorado which are under 10,000 population and which are within 150 miles of a metropolitan area or large city. Other criteria could be specified, and these are only examples. There are limits on the number of alternatives of which individuals can make good use in choice behavior; hence the number of items available as selection criteria should probably not be more than five to seven, even though the number of descriptive items to be printed out about each community may be larger.

This form will also permit a physician to indicate that he is interested in seeking a partner or would be available as a partner, and permits the user to specify some general interests and/or qualifi-

cations. Interests could include such things as type of practice, community size preferences, and other items relevant to identifying potentially compatible partnerships. Qualifications could include such things as specialty, experience, etc.

(iii) The notice of desire to remain in the system is needed to assure that records or cases on file in the system are current. The notice will be for the use of both physicians and communities and is for the purpose of informing the SPACC staff periodically of user desires to have their records retained in the files.

(b) Collecting Community Information. Communities in the shortage region to be serviced by this module will be contacted for purposes of determining their need for an interest in participating in the module. Contact will initially be by mail, to be followed up by personal contact with those communities responding positively. The personal contact will involve trips by the project coordinator to meet with community representatives for the purpose of assessing the community's needs and identifying its assets in terms of attracting physicians. It is thought that such personal contacts are essential both for getting communities to utilize the module's services effectively and for instructing them in how to present their community in the best light when contacts with physicians are effected.

(c) Collecting Physician Information. Unlike the PIM and the RIM, which serve clearly identified groups of persons, the SPACC seeks to reach physicians many of whom may not be easily identified or contacted through specific sources. Consequently, the collection of physician information must be coordinated with the publicity effort. It must also be coordinated with the collection of community information so that by the time there are numerous physicians in the system, there are also sufficient numbers of

communities in the system to make it worthwhile to the physician users.

(d) Writing Computer Programs. Several programs must be written for this module. The main program processes user requests for listings of records in the file which match the criteria specified by the user. Since there are three clases of users (communities seeking physicians, physicians seeking practices, and physicians seeking partners or associates) this program must service three different types of user requests. Briefly, the program must identify the type of user whose request is being processed, read the relevant criteria by which matches will be sought in the files, and then read the appropriate file to search for records meeting the criteria. An output subroutine is also required to format the listings which are to be printed. A program will also be needed for updating records and for adding and deleting the records of users who are entering or leaving the system.

(e) Filing Community and Physician Information. Once community information has been collected and the necessary computer programs written, the files on which this information will be stored can be created. Creation of these files should occur prior to initial operation of the system. This task involves putting the data on a storage medium such as tape, and checking the file to be certain that the data are accessible and can be processed by the programs which will use them.

(f) Keypunching. This task can begin after community information has been collected and must be finished prior to creation of the files.

(g) Publicizing the System. This effort will take two forms. The first of these is printed material directed at specific audiences which would be most likely to find the system useful. This type of publicity involves advertisements placed in professional journals reaching physicians, particularly primary care physicians. It will also involve written com-

munication to directors of primary care residency programs informing them of the services available through the module. The second form of publicity will involve demonstrations and exhibitions at annual professional meetings of primary care specialty societies. The exhibits will consist of visual displays and demonstrations will be provided by a terminal from which the files in the module can be accessed. Physicians will be given demonstrations of the module's operation by having their own preferences entered into the system and a list of communities meeting their criteria printed out for them.

(h) Initial Operation of the System. Initial operation of the system will begin ten months after the inception of the project. At this time, requests will be processed from all types of users.

2. Module Operation. Figure 11 shows the tasks involved in the continued operation of the system. All of these are ongoing throughout the year. Community information must be updated, and this updating may take two forms: altering the information on file about the community, or deleting the community from the system if it has obtained the physician(s) it needed. Additional information may be collected on communities which were not included in the system during the first year. Such might be the case for communities which could not be contacted in person the first year, or whose needs and situation were such as to require extra time for personal contact, or whose needs have changed since the beginning of the project such that they find themselves in need of a physician or physicians. The latter case is apt to be the most likely. Physician information must be updated, either by adding to the file physicians who enter the system for the first time or by deleting physicians who have found practices.

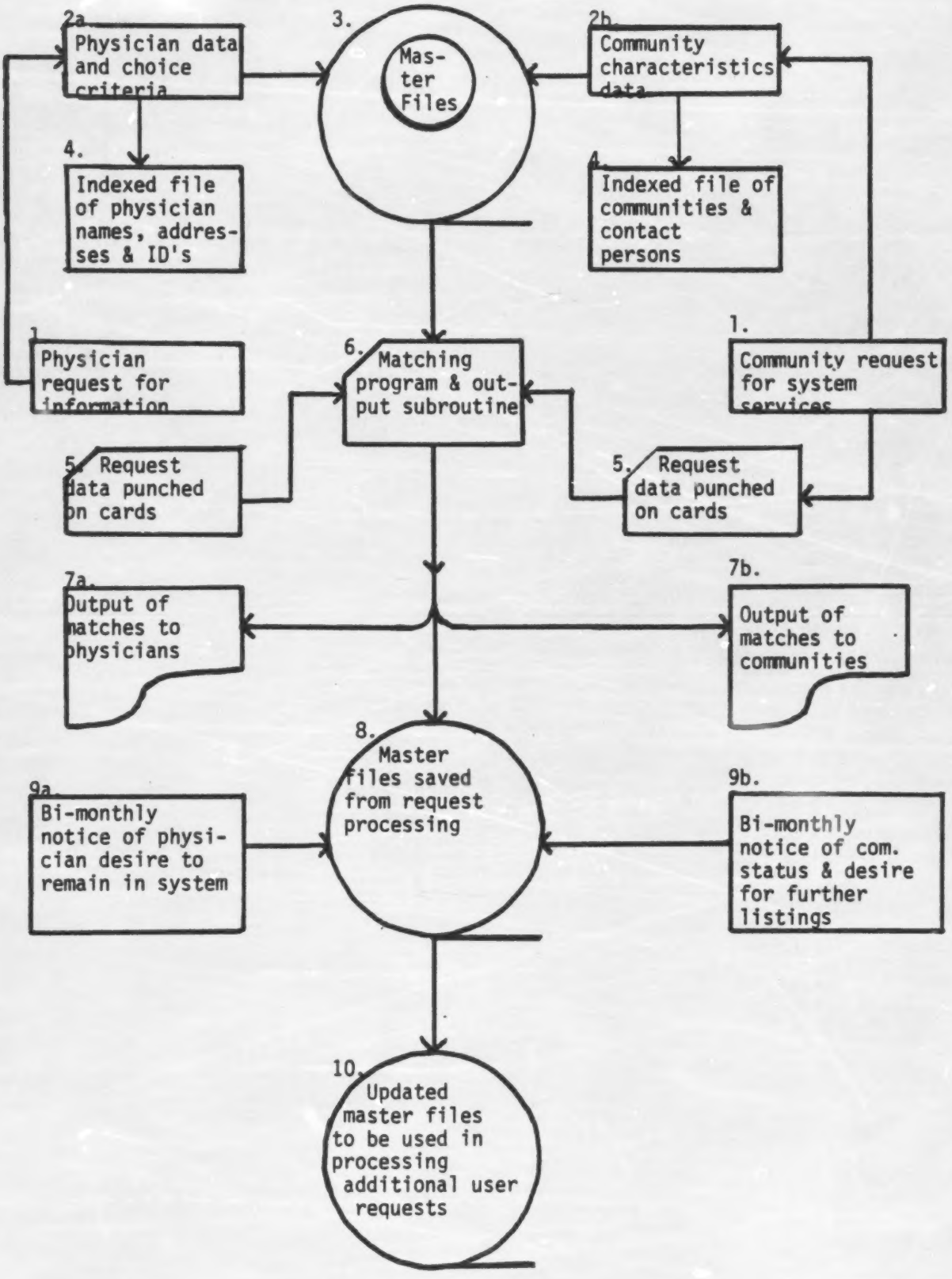
More detailed description of the actual operation of the system is given in Figure 12. The numbered components and steps of this operation will be described in detail to give a better picture of how the module works.

(a) Physicians requesting information about the system will be sent the following: (1) a brochure describing the system, the services available, and the scope of communities included in the system; (2) a pre-coded form to be filled out supplying personal data such as name and address, the services desired (i.e., listing of communities and/or listing of other physicians looking for partners or associates), and selection of criteria for either or both kinds of outputs. Communities which have been contacted and wish to enter the system will also be asked to fill out a pre-coded form supplying the name and address of the individual(s) serving as a liaison between the community and the system and as contacts for physicians interested in learning more about the community. The form will also ask for data on selected community characteristics such as population, distance from metropolitan areas, and other data relevant to physician interests.

(b.1) Information from the pre-coded form filled out by physicians is input to the master files described below. This form identifies the type of service desired by the physician (i.e., a listing of communities and/or a listing of other physicians looking for partners or associates), requests personal data such as name and address, and enables the user to specify the selection criteria he wishes to use in obtaining his output. A physician user may request either or both types of service and thus obtain either or both types of outputs.

FIGURE 12

Computerized Operations and Basic Components of the SPACC



(b.2) The pre-coded form to be filled out by community liaison persons asks for the name and address of the liaison individual(s) who may be contacted by physicians interested in learning more about the community, and asks for data on selected community characteristics such as population, existing medical services and facilities, distance from metropolitan areas, medical schools, and labs, and other data relevant to physician interests. The part of the form which is not pre-coded provides communities the opportunity to write a narrative description of the unique and distinctive features of the community which cannot be described in the pre-coded section.

(c) The master files provide a stroage medium for data on physician perferences, community characteristics and narrative descriptions. These files are the source of the data on which the selection program operates and of the information which is printed out when matches are found between any of the user listings.

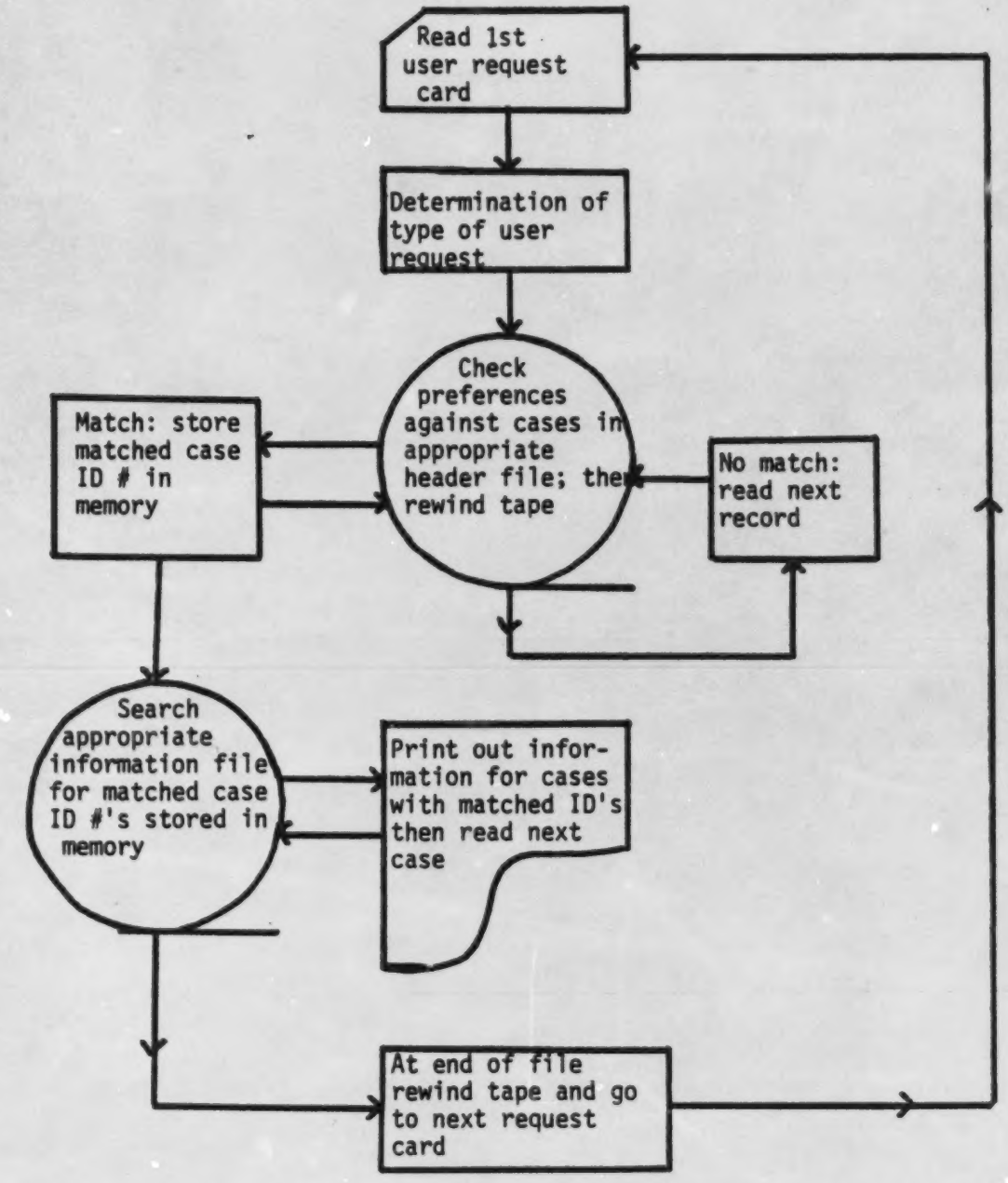
(d) For both physicians and communities, an indexed card file will be kept for clerical purposes. These files are needed for those instances in which information about or interaction with users is necessary outside of the computerized part of the module.

(e) User requests for listings, whether physicians or communities, are input to the computer operations by means of cards which serve to activate the matching program's search procedure. These cards are necessary for informing the computer program of which users are accessing the files and for specifying the type of listing desired by the user.

(f) The matching program processes user requests for listings of those records in the files which meet the user's choice criteria. A general flowchart of the operations of the matching program is shown in Figure 13. This program does several things. First of all, it reads the

FIGURE 13

General Flowchart of Operations of Matching Program for SPACC


Read 1st user request card
Determination of type of user request
Check preferences against cases in appropriate header file; then rewind tape
Match: store matched case ID # in memory
No match: read next record
Search appropriate information file for matched case ID #'s stored in memory
Print out information for cases with matched ID's then read next case
At end of file rewind tape and go to next request card

Key:

= IBM card

= magnetic tape

= decisions made by computer program

user request card and from it determines the type of request being made of the system and the selection criteria specified by the user. Requests may be of three types: requests for listings of communities; requests for listings of potential physician partners or associates; and requests for listings of physicians seeking practice locations. Once the type of request has been determined, the program checks the appropriate header file for cases which match the user's criteria. The header file contains coded values on which selections can be made along with the ID numbers of each case (physician or community). ID numbers of cases which match the user's criteria are stored in memory. The program then reads through the narrative description and prints out the relevant information for each of the cases whose ID numbers were stored in memory earlier. The program then goes back and reads the next user request card and repeats the process. The output subroutine provides formatting for the output of listings which meet the criteria specified by the user.

(g.1) Physicians may receive two kinds of outputs. The first type is of communities which met the user's selection criteria. These outputs list data describing community characteristics and include with such data the narrative description of attractive features of the community which could not be included with the "hard" data. Included in these community listings also is information concerning licensure in the state in which each community is located. This is necessary since the pool of physicians using the module is quite likely to contain physicians from various parts of the country. The other type of output which a physician may receive is a listing of other physicians who are interested in being contacted concerning partnerships or associateships. These two types of listings are separate since they are processed

separately by the matching program even though they may be requested by the same physician.

(g.2) Communities receive only one kind of output, that listing physicians whose preferences matched the characteristics of the community. Like communities, physicians have the opportunity to enter in their file record a narrative description of their preferences or themselves and this description will also be printed out whenever they are matched with other users requesting physician listings.

(h) The master file as described in 'c' above is saved after processing user requests. It is updated periodically. This updating is a function of the bi-monthly notices of user desire to remain in the system.

(i.1) The number of communities in the system probably will not change significantly over short periods of time, and for practical purposes there is little need for physicians to request new listings in the hope of obtaining listings of additional communities which have been added to the system. However, there are other reasons for a physician's remaining in the system. First of all, a physician user may wish to change the selection criteria he employed on his initial request and thus receive a different list of communities. Each output he receives will contain information on such further use of the system. Second, even if a physician is satisfied with his initial list of communities, he may wish to remain in the system to have his name available to other physicians who are interested in partnerships. Third, if the physician has entered the system to obtain listings of potential partners, he may wish to continue receiving physician output listings from the system, since this

type of listing may change over shorter periods of time than the listing of communities. Physician users will be sent post cards which can be mailed back informing the SPACC operations center of their desire to remain in or be taken out of the system. It is thought that a bi-monthly notification time is adequate for the SPACC since there are no deadlines such as are found with the RIM.

(i.2) Communities will also be contacted on a bi-monthly basis. This contact will ask the liaison person in the community to notify the SPACC center of any change in the community's status regarding its need for physicians. If a community has obtained a physician and no longer requires the services of the system, it will be deleted from the files. If the community has not obtained a physician it may request to remain in the system and will continue to receive physician listings periodically.

(j) Based on the results of the bi-monthly notification process, the master file will be updated. Such periodic updating will be done bi-monthly and will involve deleting those cases which no longer require the system's services. New physician users who enter the system in between notification times will be added to the file at the time they request to use the system. (Step number 1 in Figure 12.)

3. Estimated Costs. Cost estimates for development and operation of the SPACC alone are shown in Table 17. The costs in this table are for ten months of development and 26 months of operation. Experience with one state's placement service for dentists has shown that it takes some time to build such a service up to the point at which it can sustain the level of usage required to satisfy the needs of all users. Assuming that all of the module's components are developed and running smoothly, this

essentially involves attracting a sufficient diversity and volume of users to assure that matching and placement will take place with sufficient frequency to make the service fulfill its functions. Such a volume of users will not be obtained overnight, nor will it be obtained without a good deal of publicity; hence the higher publicity costs for this module.

It should also be recognized that this module is not a general placement service. Rather, its focus is on a fairly limited range of positions and locations. Since it focuses on underserved settings, a special effort must be made to attract physician users who might be interested in the communities on which the system focuses. Given the special "mission" of this module, it may not be feasible to sustain the module's operation by means of user fees. For this reason, no estimates have been made of the user fees which would be needed to cover the costs of the system. The volume of physician users cannot be estimated with any degree of accuracy as it could for the other modules. The possibility of self-sustaining fees could be tested in the third year to determine the feasibility of such a practice, but at this point it seems doubtful that the module could be maintained without some kind of subsidy. Consequently, Table 18 gives estimates only for the costs of sustaining the SPACC after the initial three-year development period.

Table 17

Estimated Costs for the System for Physician and Community Contact

(SPACC)

	Year 1	Year 2	Year 3	Subtotals
I. Staff Salaries				
A. Project Director[1] (25% time yr. 1; 12½% yrs. 2 & 3)	$ 7,000.00	$ 3,780.00	$ 4,080.00	$14,860.00
B. Project Coordinator[2] (100% time)	$13,500.00	$14,580.00	$15,750.00	$43,830.00
C. Programmer[3] (25% time in yr. 1)	$ 4,000.00	-----	-----	$ 4,000.00
D. Executive Secretary[4] (20% yr. 1; 12½% yr. 2 & 3)	$ 2,000.00	$ 1,350.00	$ 1,460.00	$ 4,810.00
E. Staff Secretary (25% yr. 1; 50% yrs. 2 & 3)	$ 1,950.00	$ 4,212.00	$ 4,550.00	$10,712.00
F. Fringe Benefits (15%)	$ 4,267.50	$ 3,588.30	$ 3,876.00	$11,731.80
Subtotals	$32,717.50	$27,510.30	$29,716.00	$89,943.80

Table 17 -- (cont'd)

Estimated Costs for the System for Physician and Community Contact

(SPACC)

	Year 1	Year 2	Year 3	Subtotals
II. Communications				
A. Postage[5]	$ 1,000.00	$ 1,800.00	$ 1,800.00	$ 4,600.00
B. Printing[6]	$ 2,000.00	$ 800.00	$ 800.00	$ 3,600.00
C. Publicity[7]	$ 6,000.00	$ 7,000.00	$ 7,000.00	$20,000.00
D. Telephone[8]	$ 3,200.00	$ 3,500.00	$ 3,500.00	$10,200.00
E. Office Materials & Supplies	$ 1,300.00	$ 1,300.00	$ 1,300.00	$ 3,900.00
Subtotals	$13,500.00	$14,400.00	$14,400.00	$42,300.00
III. Computer Operations				
A. CPU Time[9]	$ 950.00	$ 4,800.00	$ 4,800.00	$10,550.00
B. Keypunching[10]	$ 1,600.00	$ 700.00	$ 700.00	$ 3,000.00
C. Cards, Tapes, Misc.[11]	$ 300.00	$ 300.00	$ 300.00	$ 900.00
Subtotals	$ 2,850.00	$ 5,800.00	$ 5,800.00	$14,450.00

Table 17 -- (cont'd)

Estimated Costs for the System for Physician and Community Contact

(SPACC)

	Year 1	Year 2	Year 3	Subtotals
IV. Travel				
A. Publicity at Professional Meetings[12]	$ 2,000.00	$ 4,500.00	$ 4,500.00	$11,000.00
B. Community Liaison[13]	$ 2,100.00	$ 1,050.00	$ 1,050.00	$ 4,200.00
Subtotals	$ 4,100.00	$ 5,550.00	$ 5,550.00	$15,200.00
Yearly Direct Cost Totals	$53,167.50	$53,260.30	$55,466.00	
Grand Total Direct Cost				$161,893.80

Footnotes for Table 17

1. The Project Director is a Ph.D. behavioral scientist with considerable background and experience in medical education research and specifically in career development of physicians. His responsibility includes coordinating all of the research endeavors and service modules comprised in the total system discussed here. The percentages of time he commits to this module reflect the need for this expertise in form development and in directing the integration of the diverse sets of information contained in this module and their transformation into a computerized system.

2. The Project Coordinator position would perhaps best be filled by someone with an M.A. in medical sociology or public health administration. He should be familiar with the dynamics of health care delivery and with the nature of the interactions which arise among the parties concerned with such delivery systems. His knowledge should enable him to communicate with these various parties about their needs, interests, and problems.

3. The Programmer should have a degree in computer science and some experience in working with data base systems. Unlike the other modules, in which additional data is to be added in subsequent years, this module requires nothing beyond periodic updating, and hence the programmer's time should not be needed past the first year.

4. The Executive Secretary is responsible for coordinating the activities of the secretarial staff for the entire project described here. Reporting to the Project Director, this person must have experience sufficient for coordinating work loads among the secretarial staff.

5. Figures for postage cover mail contact with communities in the designated shortage region; mailings of information packets to family practice residency programs; and contact with physicians who request information from the system. Higher figures for second and third years reflect the fact that these years are full operational years and have more active services to physicians.

6. Printing covers forms needed to gather information; letterhead stationery; postcards; and brochures describing the system.

7. This publicity item is limited to materials sent to family residency programs and ads placed in professional journals.

8. Telephone figure is for a WATS line for 10 hours/month @ $250/month; plus remote hook-up demonstrations.

9. The first year's figure is for program testing and file construction. Years 2 and 3 include processing time for user requests and expenses for an on-line file which can be used with a remote terminal for demonstration purposes at professional meeting.

10. Includes punching community information for an estimated 300 communities with 30 cards/community @ $.15/card; also punching programs written for module.

11. Includes cards for punching physician preference data and for running program testing and user request jobs; tapes for storing and processing physician and community data; and rental facilities at computer center.

12. Travel to professional meetings during the first year estimated for two meetings, with two persons per trip @ $450/person/trip. The two persons include the project coordinator and the programmer, who is needed to set up the remote terminal hook-up with the on-line file for demonstration purposes. Travel for second and third years is estimated for four meetings with two people attending each meeting; calculated @ $450/person/trip; figure also includes consultant fees for programmer who is not salaried during the last two years for this module.

13. Community liaison involves travel by the coordinator to meet with community officials for the purpose of assessing their needs and resources and to aid in presenting the community's image to physicians. Calculated on the basis of two air trips @ $400/trip/person and four ground trips of five days each traveling approximately 800 miles per trip @ $.17/mile and $35/day. Second year includes only two ground trips and 1 air trip, calculated similarly.

Table 18

Estimated Annual Costs for Sustaining SPACC after Initial 3-year Development Period

I.	Staff Salaries	
	A. Associate Director[1] (5% time)	$ 1,460.00
	B. Programmer[2] (5% time)	$ 940.00
	C. Administrator[3] (20% time)	$ 2,400.00
	D. Staff Secretary (50% time)	$ 4,550.00
	E. Fringe Benefits (15%)	$ 1,402.50
	Subtotal	$10,752.50
II.	Communications	
	A. Postage	$ 1,800.00
	B. Printing	$ 800.00
	C. Publicity	$ 6,000.00
	D. Materials and Supplies	$ 1,300.00
	Subtotal	$ 9,900.00
III.	Computer Operations	
	A. CPU Time	$ 4,800.00
	B. Keypunching	$ 700.00
	C. Cards, Tapes, Misc.	$ 250.00
	Subtotal	$ 5,750.00
	GRAND TOTAL[4]	$26,402.50

Footnotes for Table 18

1. The Associate Director's time is mainly for correspondence with medical societies, residency programs, and other groups or individuals who might be interested in learning about the module.

2. The Programmer's time is mostly for trouble-shooting should the need arise, and for consultation should it become necessary to implement changes in some part of the system's operation.

3. The Administrator should be someone with a B.A. with the background and training necessary for supervising a clerical staff and for keeping the operations running smoothly.

4. These costs only cover operation of the module and do not include overhead which would be required for housing the project. Obviously the project would have to be subsidized or sponsored in this respect; otherwise these overhead costs would have to be added on to the figure given here.

H. Estimated Costs for the Entire System

Given the cost estimates in the preceding sections, we can now estimate the costs of the entire system. These costs are shown in Table 19. As with the costs estimates for the separate modules, the estimates in Table 19 do not include any overhead costs, and for the same reason. The figures in Table 19 are in some instances less than the sums of the corresponding figures in the tables presented for the separate modules. These instances have been identified by footnotes. For the most part, these are cases in which some efficiencies could be realized by undertaking the whole system at once.

The total figure in Table 19 is large -- slightly over 1 million dollars. The effort proposed here is large, too, however, for the problems of physician training and health care delivery are both large and complex. Considering the scope of effort involved in this sytem and the return from that effort, the cost does not seem excessive.

COST ESTIMATES FOR ENTIRE TRACKING SYSTEM AND ASSOCIATED MODULES

(CREAM, MBTI, PIM, WIM and SPACC)[1]

	Year 1	Year 2	Year 3	Subtotal
I. Staff Salaries				
A. Project Director (100% time yrs. 1 & 2; 75% time yr. 3)	$ 28,000.00	$ 30,240.00	$ 24,495.00	$ 82,735.00
B. Associate Project Directors (2 x 100% yrs. 1-3, 1 x 100% yrs. 1, 2, and 5% yr. 3)	75,000.00	81,000.00	59,780.00	215,780.00
C. Programmer (100% yrs. 1, 2; 40% yr. 3)	16,000.00	17,280.00	7,465.00	40,745.00
D. SPACC Coordinator (100% yrs. 1, 3)	13,500.00	14,580.00	15,750.00	43,830.00
E. Executive Secretary (100% yr 1, 2; 75% yr. 3)	10,000.00	10,800.00	8,748.00	29,548.00
F. Research Assistants (2 x 100% yrs. 1-3)	20,000.00	21,600.00	23,328.00	64,928.00
G. Staff Secretaries (4 x 100% yrs. 1 + 4 x 100% yr 2 + 6 x 100% yr. 3 + 1 x 25% yr 1 + 1 x 50% yrs. 2-3)	33,150.00	37,908.00	59,150.00	130,208.00
H. Fringe Benefits (15% of salaries)	29,347.50	32,011.20	29,807.40	91,166.10
SUBTOTAL	$224,997.50	$245,419.20	$228,523.40	$698,940.10

A. Postage	$ 12,100.00	$ 16,275.00	$ 26,100.00	$ 54,475.00
B. Printing	15,500.00	26,600.00	13,100.00	55,200.00
C. Publicity	10,000.00	13,000.00	15,000.00	38,000.00
D. Telephone[2]	6,000.00	6,000.00	6,000.00	18,000.00
E. Office Materials & Supplies[3]	8,650.00	8,800.00	9,400.00	26,850.00
F. Miscellaneous[4]	2,500.00	17,850.00	4,650.00	25,000.00
SUBTOTAL	$ 54,750.00	$ 88,525.00	$ 74,250.00	$217,525.00
III. Computer Operations				
A. CPU Time	$ 7,930.00	$ 24,000.00	$ 28,200.00	$ 60,130.00
B. Keypunching	6,250.00	17,200.00	7,500.00	30,950.00
C. Cards, Tapes, Misc.[5]	1,100.00	1,200.00	1,120.00	3,420.00
SUBTOTAL	$ 15,280.00	$ 42,400.00	$ 36,820.00	$ 94,500.00
IV. Consultants & Auxiliary Personnel				
A. Contacts at Preceptorship Schools	$ 600.00	$ 13,200.00	$ 13,200.00	$ 27,000.00
B. Contacts at Non-Preceptorship Schools	400.00	2,400.00	2,400.00	5,200.00
C. MBTI Consultants	1,500.00	---	---	1,500.00
SUBTOTAL	$ 2,500.00	$ 15,600.00	$ 15,600.00	$ 33,700.00

V.	Travel	$ 21,800.00	$ 12,550.00	$ 11,500.00	$ 45,850.00
	YEARLY TOTAL	$319,327.50	$404,494.20	$366,693.40	
	GRAND TOTAL				$1,090,515.10

FOOTNOTES FOR TABLE 19

1. The figures in this table are for the most part sums of corresponding figures in the cost estimates tables for each of the separate modules. The exceptions have been footnoted and an explanation provided for each exception.

2. The telephone company offers several different types of WATS line services and rates. The customer buys "packages" of time: 10 hours per month, 20 hours per, etc. It is not possible to buy odd numbers of hours, e.g., 4.5 hours per month. It is thus estimated that all of the modules could be adequately served by 20 hours of usage per month, even though in the separate cost estimate tables the number of hours are greater than this since those estimates had to be based on 10-hour blocks of time.

3. These figures are 80% of the sum of the corresponding figures in the separate cost estimate tables. It is assumed that there is some overlap in some of the basic office supplies needed to "start up" an office and that these could be shared were all modules to be funded.

4. These figures include the cost of MBTI questionnaires, answer sheets, and scoring.

5. These figures are 80% of the sum of the corresponding figures in the separate cost estimate tables. It is assumed that some sharing of rental items (e.g., disk pack) could occur were all the modules to be funded.

VI. INCENTIVES

Throughout the description of the tracking system and service modules, the point was made repeatedly that the service modules, in addition to being of value in and of themselves, functioned as incentives for students to remain in the tracking system. In this section, that point is elaborated further and other types of incentives are also considered.

A. Student Incentives

The basic assumption on which the service module concept rests is that during their medical training students are swamped with facts and information, most of which has to do with the clinical and scientific aspects of medical practice and very little of which has to do with the career alternatives about which they must begin making decisions even as undergraduates. Medical students simply do not receive either the kind of quality of information about career niches which they need to make career decisions that are "right" for them. While this is presented here as an assumption, the number of physicians who change residencies, specialties, or practice settings and the student responses to the service module questionnaire (presented in Appendix B) indicate that it is not entirely unfounded. The overwhelmingly positive responses by students to the service module concepts indicate that these modules would indeed provide students with much needed information and thus would appear to be valuable incentives for their continued participation in the tracking system.

There are other kinds of incentives which could be used, however. One of these is to make participation in the study mandatory at those schools

selected for the sample. This would require an agreement between the Deans of the schools and the project staff. Such an incentive has more drawbacks than advantages, however. For one thing, it merely displaces the location of the incentive; the Deans would have to be pursuaded to sanction the study and to require participation by students, and available incentives for cooperation on their part might be difficult to come by. Second, such an incentive would only work during students' undergraduate years and would not be effective after they had entered residencies. Third, the possible resentment created by making participation mandatory could result in ill will between students and the project which might greatly reduce voluntary participation after graduation.

Another incentive which could be used is payment for each set of questionnaires completed by each student. This method has been used before in at lease one longitudinal study (at New Mexico) and worked fairly well there. Payments in that study were on a graduated scale: undergraduates received five dollars and residents received ten dollars. Using these rates as bases, we can estimate the costs of using payments as incentives for the first three years of the tracking system. Table 20 shows figures for payment costs and module costs for the initial three years of the tracking system and for an additional three years. It also shows total cost comparisons for the first three-year period, the second three-year period, and for the entire six-year period for which cost estimates have been calculated.

Obviously in terms of costs alone, payment is the cheaper incentive during the first three years. It is not necessarily best, however, and there are several factors which should be considered in assessing the

Table 20

Relative Costs of Payments versus Modules as Incentives for Tracking System

Year	Cumulative # of Students[1]	Payment Costs @ $5. per Administration	Payment Costs @ $10. per Administration	Module Costs		Difference[2] $5 rate	Difference[2] $10 rate
				$44,735.	PIM		
				$63,952.	RIM		
				$66,860.	WIM		
				-0-	SPACC[3]		
1	8,800	$44,000.	$88,000.	$175,547.	Total	$131,547.	$87,547.
				$40,855.	PIM		
				$89,981.	RIM		
				$91,710.	WIM		
				-0-	SPACC		
2	11,000	$55,000.	$110,000.	$222,546.	Total	$167,546.	$112,546.
				$ 41,270.	PIM		
				$122,128.	RIM[4]		
				-0-	WIM[4]		
				$ 53,167	SPACC[5]		
3	13,200	$66,000.	$132,000.	$216,565.	Total	$150,565.	$84,565.
				$126,860.	PIM		
				$276,061.	RIM		
				$158,570.	WIM		
				$ 53,167.	SPACC		
Total for 3 years		$165,000.	$330,000.	$614,658.	Total	$449,658.	$284,658.

Table 20 -- (cont'd)

Relative Costs of Payments versus Modules as Incentives for Tracking System

Year	Cumulative # of Students	Payment Costs @ $5. per Administration	Payment Costs @ $10. per Administration	Module Costs		Difference $5 rate	Difference $10 rate
				$25,885.	PIM[6]		
				$49,080.	RIM[6]		
				-0-	WIM		
				$53,260.	SPACC		
4	15,400	$77,000.	$154,000.	$128,225.	Total	$51,225.	-$25,775.
				$25,885.	PIM		
				$49,080.	RIM		
				-0-	WIM		
				$55,466.	SPACC		
5	17,600	$88,000.	$176,000.	$130,431.	Total	$42,431.	-$45,569.
				$25,885.	PIM		
				$49,080.	RIM		
				-0-	WIM		
				$26,402.	SPACC[6]		
6	17,600[7]	$88,000.	$176.000	$101,367.	Total	$13,367.	-$74,633.
				$ 77,655.	PIM		
				$147,240.	RIM		
				-0-	WIM		
				$135,128.	SPACC		
Totals for Years 4-6		$253,000.	$506,000.	$360,023.	Total	$107,023.	-$145,977.

Table 20 -- (cont'd)

Relative Costs of Payments versus Modules as Incentives for Tracking System

Year	Cumulative # of Students	Payment Costs @ $5. per Administration	Payment Costs @ $10. per Administration	Module Costs		Difference $5 rate	Difference $10 rate
				$204,515.	PIM		
				$423,301.	RIM		
				$158,570	WIM		
				$188,295.	SPACC		
Grand Totals for Years 1-6		$418,000.	$836,000.	$974,681.	Total	$556,681.	$138,681.

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Footnotes for Table 20

1. These figures are based on an estimated 8800 students entering the system the first year (2200 from each graduating class and including freshmen through seniors). Subsequent years include the additional 2200 freshmen entering the system each year.

2. Differences between the module costs and the $5 and $10 rates are figured by subtracting the payment costs for each year from the module costs for that year. Positive numbers are the amounts by which module costs exceed payment costs, while negative numbers are the amounts by which payment costs exceed module costs for that year or time period.

3. If the modules are utilized only as incentives for students in the system, there would be no need for SPACC development to begin until the third year, since none of the seniors who entered the system in year 1 would be ready for practice until year 4.

4. The original cost estimates for the WIM alone showed a small amount of expenditures during the third year, primarily for mailing out the booklet. If the WIM were to be used as an incentive in the tracking system, it could be mailed out to students during the course of the tracking system's operations. In this case, the mailing expense would be included in the operation of the tracking system. Hence for this and subsequent years, no additional costs beyond the development costs are listed for the WIM.

5. Development of the SPACC must begin during this year in order for the module to be operational and available to the seniors of year 1, who will be starting their last year of residency in year 4.

6. For this and all subsequent years, the cost estimates are based on the self-sustaining costs estimated earlier in the section describing this module.

7. Although an additional 2200 freshmen enter the system in year 6, there are 2200 residents who enter practice. Continuous tracking ceases for these students, and thus the number of residents leaving the system balances the number of freshmen entering the system each year. Although continuous tracking is no longer maintained for these residents, this does not preclude their being surveyed again at some later date.

relative cost effectiveness of the two types of incentives. First of all, payment may not be as strong an incentive as the service modules. Students appear to need and want the services which could be provided by the modules, and it may be that from a student's point of view the services provided by the modules would be worth more than the five or ten dollars. Second, the five and ten dollar rates used in the estimates above are quite small compared to payment schedules for other types of experiments done in medical schools and the degree of incentive elicited may be correspondingly small. Some drug studies pay as much as $25 per hour, and the time required to fill out the battery of instruments which would be given to students in the tracking system would be at least two or more hours, depending on the sample group. Third, the value of the service modules goes considerably beyond that of merely providing incentives for students. It is virtually impossible to assess this value monetarily in any adequate way since it is concerned with giving students career-relevant information, and no studies have been done (since such services have never been offered before) which could estimate either the monetary value of this information to students and the society which finances their education or the monetary value of changing trends in medical student career preferences which might result from the existence of these information services.

In comparing the cost figures of payments versus service modules, it should also be recognized that figures for the first three years are based on the development costs of the modules. The costs of operating the modules after the initial three-year development period are less, as is shown in Tables 13, 15, and 18, and of course the WIM has virtually no costs at all after the second year. Consequently the cost comparisons for an additional three years of operating the tracking system show a somewhat different

story as Table 20 also illustrates. During the second three years, the modules cost less than the $10 payment incentive.

One other point deserves mention concerning the use of service modules as incentives to students, and this relates to the fact that these service modules will be available to students outside of the tracking system. The question which immediately arises is how can the modules be incentives to remain in the tracking system when they would be available to students regardless of whether or not they participated in the system? The answer is to make the service modules available without charge to students in the tracking system and to charge students who are not in the system (or who drop out) a fee for using the modules.

Finally, it should be obvious that if the modules are to be used as incentives for tracking students over a period longer than three years, it would not then be possible to charge fees for use of the modules by students in the system. Consequently, if such were the case, the modules probably could not be self-sustaining since it seems unlikely that user fees from students outside of the system would be adequate to cover the costs of operating the modules.

B. Program Incentives

If the tracking system and service modules are to operate effectively, cooperation must be obtained not only from students but also from preceptorship and residency programs and physicians to be sampled in the WIM. It may not be possible to provide incentives in all instances, but where it is possible such incentives should be used. Physicians sampled for the WIM can perhaps be given only moral or professional incentives, such as the auspices of specialty and state medical societies and a reference to the

value of their assistance in providing a service to medical students.

Preceptorship and residency programs, on the other hand, are another matter. It will be possible to offer these programs some kind of tangible return for their participation. There are two kinds of incentives for programs. The first is the opportunity to use the system itself. Programs may request listings of students for recruitment purposes just as students may request listings of programs from which they may select those they wish to enter or to which they may wish to apply.

The second type of incentive involves receipt of data on student ratings of their experiences. In some cases this may be a sensitive issue, and the collection of such data should be optional at the discretion of preceptorship and residency program directors. The data to be collected will of necessity be standardized across all programs, and some attempt should be made to reconcile the needs and interests of the various programs in devising the rating questionnaires. This should not be as difficult a task as it might otherwise be since the pooling of needs and interests will not involve consolidation of existing research instruments and projects, but rather the construction of entirely new instruments by the staff of each module.

The uses to which student rating may be put will depend on the needs of the various programs. While such ratings are not at this point intended to serve as the basis for a full scale evaluation of each program, the data could nevertheless serve useful functions in providing program directors with information about specific aspects of their programs and student reactions to them. Such data could serve to identify specific aspects of programs which need improving or which are working effectively.

C. School Incentives

Since they are an essential part of the sample selection process and since the CREAM would require their cooperation, schools should also be provided with incentives for participating in the project. It may be that in some cases schools would be willing participants without having any direct return, but cooperation will probably be more readily forthcoming if each school can be assured of having something of value in return. It is suggested, then, that schools be offered two types of return.

The first of these consists of the data collected on students at the participating school. That is, each school would receive the data collected on its own students. This data should be processed and ready for input to a computer for analysis by research personnel at the school. Probably the most convenient form in which to return data to each school is punched cards accompanied by lists of items and field formats.

The other type of information to be provided to schools would be aggregated statistical summaries of data collected across all schools participating in the CREAM. Since this data would be aggregated, no school or student would be individually identified, and schools would not have to worry about being publicly compared to other schools. Such comparisons could only be made by each school using its own data.

Given these two types of incentives, we can now consider the types of circumstances which might be found at schools selected for the CREAM sample. The points to be made here are derived from extensive formal and informal contact by the Longitudinal Study project at New Mexico with longitudinal research groups at other medical schools, and from a national survey of preceptorship programs and a workshop of preceptorship program personnel,

both conducted under contract # 231-75-0606 with the BHRD, Health Resources Administration.

First of all, not all schools have longitudinal study projects or even short range research efforts directed at studying medical career development. Schools without such projects would obviously have the most to benefit from participating in the CREAM. By merely agreeing to permit data to be collected on their students at no expense to themselves, these schools would have available to them data which could be used for investigating a wide range of career development processes. The only expense to the schools would be for a researcher's time and computer facilities.

Some schools are conducting longitudinal or short range research projects, but for the most part these studies are focused only on relatively limited aspects of career development processes or the factors which influence these processes. A typical example would be a school whose project is limited to studying the effects of preceptorship experiences on student attitudes. Other schools of this type may be investigating the effects of preceptorships on clinical skills, the effects of personality on career preferences, or simply the changes in career preferences over the four years of undergraduate training. Projects of this scale often are conducted by personnel who have little or no training in behavioral science research (e.g., M.D.'s), often have only limited budgets and are therefore not of the scope and depth which is necessary for untangling the complex web of casual relations which influence career development and dispositions. This is not necessarily a criticism of these studies, for usually their intent is not to investigate the variety of casual influences which bear on career choices, but rather merely to look at much more limited relations among spe-

cific variables.

It must be emphasized, however, that research such as that envisioned for the CREAM, which is designed to aid in making funding decisions regarding which programs will be most cost effective in encouraging students to enter shortage niches, must go beyond merely looking at bi-variate or tri-variate relationships among limited sets of variables. Any research effort which truly seeks to provide the kind of insights into behavorial processes which will have practical utility in the area of medical student career development must have a multi-variate orientation.

Because it generally goes much beyond the level of research effort found in many schools, the CREAM offers these schools the opportunity to undertake more complex studies than those in which they may be presently engaged. Some of these schools simply may not have the internal funds for projects of a larger scale, and the CREAM would provide them with the opportunity to carry their efforts further. Still other schools may find the CREAM data attractive for exploring questions which they had not considered previously. In fact, this latter point is significant not only for the schools concerned but also for the development of physician manpower in general. Providing schools with the kind of comprehensive data available through the CREAM could stimulate the investigation and exploration of new ideas, approaches and programs in the area of physician career development. Should such a "spin-off" effect occur, the new ideas and approaches thus stimulated would probably be more diverse and appropriately tailored to the unique circumstances of each school than would be the case if the CREAM data were accessible only to one school or a single research staff.

A third general category of schools (fairly limited in number) have more comprehensive longitudinal or cross-sectional studies in progress. Not all of these projects are focused entirely on student career development; some of them include other concerns as well. Nevertheless, these schools have fairly extensive ongoing data collection efforts. These few schools are perhaps the least likely to be interested in participating in the CREAM, and there are two main reasons for this. First of all, their students are already subjected to an extensive battery of instruments and the CREAM would simply add to this burden. Second, although the items on their instruments may not be the same as those of the CREAM, these schools may collect similar types of data, and thus the data collection efforts might overlap to some extent. Such schools may not be completely averse to cooperating with the CREAM project, but realistically those few schools which do have extensive projects of their own may be less inclined to do so than other schools. There are some reasons why such schools might wish to participate, however. First of all, most of even the more elaborate research projects do not include all of the types of variables on which the CREAM will focus, and thus the CREAM would provide them with more extensive data. Second, the instruments used in many existing projects do not obtain either the quality or quantity of data which they otherwise might. For instance, many instruments assessing career preferences ask the student to indicate the one specialty he presently is most inclined to enter. The more sophisticated of such instruments then ask the student to indicate how strontly he feels about that one preference.

The career instrument to be used in the CREAM, on the other hand, asks students to rate each of some 26-30 specialties on a 7-point scale. This instrument thus obtains the strength of student preferences for an extensive list of specialties, rather than just the strength of the student's first choice. In proportion to the immensely greater amount of data obtained, the additional time and effort required on the part of a student filling out the CREAM's career preference instrument is relatively small. Similar statements could be made about some of the other instruments to be included in the CREAM. It is thus apparent that even schools with ongoing projects might see the value in having data from the CREAM available and consequently might be interested in participating in the system.

Providing schools with data collected on their own students necessitates a consideration of the confidentiality issues involved. Students must be informed that the data will be available to research personnel at their own schools as well as to the project staff of the CREAM. Experience with the longitudinal study at New Mexico indicates that this need not be perceived as threatening by students. However, it is well worthwhile to be completely honest and open with students and to take time to explain what the data will and will not be used for.

VII. CONFIDENTIALITY

In American society today, any system which is designed to collect information about individuals must be concerned with the confidentiality of that information. This concern can be seen as having two foci: the legal responsibilities of the agency, contractor, or group which collect the information; and the concerns, fears, and reservations of those persons from whom information is to be collected. As a feasibility study, this report primarily deals with the technical aspects of implementing the tracking system and service modules, and no assumptions have been made about who funds or sponsors all or part of the system. For this reason, no extensive legal opinions will be set forth here concerning the requirements of the Privacy Act or the Freedom of Information Act, both of which apply only to government agencies. For the same reason, the cost estimates and descriptions of the functioning of the tracking system and service modules did not include any mention of the clerical staff and procedures which would have to be incorporated into the modules to comply with the two Acts. Nevertheless, some mention must be made of the issues raised by these Acts, if for no other reason than that they are directly relevant to the concerns of students who will be in the system. The discussion below will focus on the capabilities of the system for meeting the intent and spirit of the Acts above, rather than on the administrative mechanisms and procedures for complying with the Acts.

The intent of the Privacy Act is fourfold: to elimate secret information systems on individuals kept by the government; to require consent of the individual when any information previously collected from that person would be used for purposes other than those of which the individual was informed when the information was initially collected; to provide individuals with access to their own records; and to require, whenever possible, that information be collected directly from the individual on whom records are being kept, that only

necessary information be collected, and that records be kept accurately. The Privacy Act distinguishes between "statistical records" and "records", the difference being that statistical records do not have the capability of individual identification, whereas other records do.

A. Research Module

With respect to the CREAM, or tracking module, while the data will be analysed in aggregate, records will still have to be identified individually for purposes of tracking. In obtaining the consent of individuals to collect the necessary data, it is difficult to specify in advance all of the specific research questions which may be investigated using the data. It is really possible only to describe in general the kinds of studies which will be conducted. This problem is related to another one, vis., that of making the data available to other researchers or to agencies needing data on trends in medical student careers.

It should be recognized that for all practical purposes it is virtually impossible to insure (or to expect the original research staff to insure) that any data distributed to other research groups or to governmental agencies will not be used for purposes other than those of which students were orginally informed. This is not to say that in giving the data to parties other than the original research group a student's privacy would be invaded or that undesirable personal consequences would result to any or all students. The point is merely that other researchers may at some distant future time wish to use the data to investigate research problems other than those to which students had originally agreed. So long as the data are distributed with any type of codes which make it possible to identify individuals, such a contingency would seem to be a violation of the letter of the Privacy Act. It would not matter that the identifying code distributed to other researchers could not directly be traced by

them to individuals. So long as there existed somewhere (most likely under the control of the original research staff) a means of translating subsequent codes into the originally assigned codes and of translating the originally assigned codes into names, it would be a violation of the Privacy Act to distribute such data.

The solution could take two forms. Students could be asked whether they agreed to have the data they provided used for the different purpose(s). In fact, this probably would not be much of a solution at all, for several reasons. First of all, one could never be certain that, by the time the data had been passed along from one researcher to another several times, any given researcher would take the trouble to request permission from students, assuming that he could even identify and locate the original research staff. Second, even if the original research staff could be contacted, it might not be possible to locate the student. Without his permission, it would be a violation of the Act to release his data to be used for purposes other than those to which he had agreed. Were this to happen with sufficient frequency, it would render the data which could be provided less useful since the number of cases would be reduced, perhaps considerably. Even more serious from a research point of view would be the fact that the missing cases might represent an unknown bias in the data.

Another solution would avoid many of the drawbacks of the first one, and this is to distribute only aggregated data to other researchers and/or agencies. Such data would not be individually identifiable and would appear to meet the intent and letter of the Privacy Act. The kind of data to be distributed might be correlation matrices, descriptive statistics such as means, standard deviations, and ranges, and other aggregated statistics. One advantage of this solution is that no data would be missing as a result of the inability to ob-

tain a student's permission to use the data.

The Privacy Act also requires that an individual's record be available for his inspection. The CREAM offers no difficulties in this regard. The data stored in the tracking file will consist mainly of numbers indicating a student's answers to questions on the instruments which he has filled out. The meaning of such numbers could only be determined by knowing which questions went with which numbers. Thus, in order to comply with a student's request to review what data had been collected from him, it would be necessary to merge questions from the instruments with the numbers stored on the CREAM data files. This would be the most complicated part of any effort at fulfilling an individual's request to see his file. If the volume of requests were great enough, it would not be difficult to develop a standard procedure for merging questions and numerical answers so that they would be intelligible to the individual, although doing so would require some extra time and expense on the part of the project staff.

One other point regarding the CREAM is worthy of mention here. Some government agencies may wish to use some data from this module for specific purposes such as recruitment. The NHSC, for example, might wish to obtain the names and addresses of students, along with information about their preferences for certain specialties or work settings. Distribution of such information could be handled within the constraints of the Privacy Act by inserting items on the relevant questionnaires asking the student whether he would be willing to release such information to the agencies listed on the questionnaire. It would be very easy to extract from the files the records of individuals who had consented to such an arrangement. This approach would require, of course, that government agencies interested in obtaining and using data from the CREAM specify what data they wanted from the files ahead of time so that the proper

items could be included on the instruments administered to students. Otherwise, permission would have to be obtained later from each student individually, and the disadvantages of that have already been discussed above.

In addition to the legal requirements set forth in the Privacy Act, some thought must be given to the fears and concerns of the students who are to be tracked. Informal conversations with students from several schools indicate that their concerns are strongly felt and that they include all data collection, not just those projects which are sponsored by the government and thus come under the Privacy Act. Students' concerns are many and varied; only a few major ones can be mentioned here.

One of their main fears is that data collected from them will be used in ways which they cannot anticipate and for purposes which might adversely affect them as individuals. Closely related to this fear is their concern that data collected from them may somehow eventually be distributed to persons, information files, or agencies with which they had no contact originally. Once the data have been distributed and the students no longer have any direct means of keeping in touch with those using it, students' fears about uses to which the data might be put are limited only by their imaginations.

This point brings up a third major concern, which is the exchange of data and potential connections among data files which were originally collected at various times by different sources. The main point here is partly that data which may be harmless enough when collected separately may be damaging (or could be used for harmful purposes) when combined across sources or files. The other part of this concern seems to stem from a general distrust and dislike of connectable data files whose interconnections are devised and maintained by an impersonal bureaucratic system. To students, the whole prospect seems too much like "Big Brother".

Such concerns among the general public in part provided an impetus for the Privacy Act. The mere passage of the Act, however, has not eliminated all concern about data collection or the interconnection of files. The concern still exists among students, and in dealing with their concerns, what must be confronted by the researcher are not just legal requirements, but the fears of the population being studied. Regardless of legal protections, student fears are quite strong; and whether they are irrational or not, they are the reality with which the researcher must deal.

The problem of allaying student concerns is one which must be solved to as great an extent as possible if a tracking effort such as the CREAM is to be successful. There are several steps which can be taken in this regard. First of all, the researcher should inform students in as much detail as possible what the data will and will not be used for, who will have access to it, what steps will be taken to preserve confidentiality of the information, what prerogatives students have with regard to accessing their own files and to determining who else may access those files, and what means are open to them for contacting directly those persons responsible for collecting and maintaining the data files. Given student concern about interconnected files, it would appear to be very unwise to attempt to merge the CREAM files with any other existing data bases. Regardless of whatever efficiencies might accrue from such a merging (and this efficiency is questionable; see Section VIII), the ill will and suspicion which would be created among students in the system might very well reduce their participation significantly.

Many of the problems which have just been mentioned regarding the Privacy Act would occur only if the tracking system were funded and/or operated by a federal agency. Were the system to be funded and/or operated by private sources, the legal constraints of the Privacy Act would not apply. This would

not mean that no safeguards need be implemented to preserve confidentiality of the data. Student concerns are such that the success of any long-term tracking effort would depend on the researcher's making every effort to preserve confidentiality of the data and his integrity in upholding students' trust.

The discussion above has focused almost exclusively on the Privacy Act, and no mention was made of the Freedom of Information Act. Unfortunately no copy of this Act was obtained by the time of the writing of this report. At this point it can only be suggested that were the CREAM to be funded by a federal agency, the contractor should be informed of his responsibilities regarding the latter Act. In fact, it would probably be a good practice for federal funding agencies to inform any contractor involved in data collection of his responsibilities under these two Acts.

B. Service Modules

The service modules providing opportunities for user interaction with computer files present a slightly different situation than the CREAM. The PIM, RIM, and the SPACC all are designed to allow each user to request listings of other users in the system. These listings will contain information about individual users. It will not be possible ahead of time to specify which individuals, programs, or communities may request information about an individual. However, individuals who use these systems will do so with the express understanding that the information they provide will be made available to other users in the system. A statement to this effect should be provided to individuals who inquire about the nature and operations of the systems, and under those situations by the Privacy Act (e.g., if any of the service modules were to be funded by a federal agency), individuals who entered the system would have to provide written consent regarding the release of information to other users in the systems.

Physicians supplying data for use in the WIM will need to be assured that the data they provide will not be distributed in any but a statistical form in which no individual identification will be possible. The WIM is the only service module which is similar to the CREAM in this respect, and the comments above about the CREAM also apply to the physician data which would be collected for the WIM.

VIII. USE OF EXISTING DATA BASES; SPONSORSHIP; CONTRACTORS

This section contains several considerations which might be taken into account in making the system proposed here a reality. The first of these has to do with part of the actual implementation effort; the other two have more to do with matters which are indirectly, but nonetheless importantly, related to the actual conduct of the research and service functions.

A. Use of Existing Data for the CREAM

In theory, the possibility of merging data bases collected at different times and places and for different purposes to produce a body of information capable of being used in a variety of ways that go beyond the scope of any single data base is an appealing one. The presumed advantages of such an effort are many. Among them are: efficiency in data collection efforts (funding of repetitive surveys gathering overlapping information is eliminated); reduced time for conducting research (lengthy time periods for collecting data are eliminated); and reducing the demands made on populations being surveyed. Disadvantages, at least from a researcher's point of view, include the fact that many times the data from other studies are not of the kind or form that would be desirable for certain types of analysis. Yet from the viewpoint of the policy-maker or a funding agency, the trade-off is often worthwhile: it is better to "make do" with existing data than to incur the costs of additional surveys.

This perspective is valid only in the general sense, however. The purpose of a given research endeavor must be serviced sufficiently to provide adequate answers to the questions or problems being addressed; and what this means is that the necessity of having access to data relevant

to the specified research purposes must not be sacrificed to the abstract desirability of using existing data bases. In short, there are times when existing data bases are not adequate for addressing the questions, problems, or issues to be investigated by a different research effort. In such cases, from a cost effectiveness viewpoint it would be better not to do the research if it had to be done solely with existing (and irrelevant) data, for the results obtained would not be worth even the cost of analyzing the data.

One existing data base which at first glance might appear to be appropriate for the CREAM is the AAMC's Medical Student Information System (MSIS). These data are collected on all students at every medical school in this country. Assuming that the data were even roughly of the type needed for those investigations for which the CREAM was designed, a data base of such scope would be quite valuable. Further, more detailed inspection, however, reveals that these data have been collected primarily from various application forms and other administrative records, and they are really not the type of information which would permit even a superficial investigation into the social phychological dynamics of medical student career development. This statement merits elaboration, because the point to be made here has implications for other similar situations in which data collected at one level are being suggested for use in a research project at other levels.

The MSIS contains data elements which, in very general senses of the terms, could be classed as "experiential", "institutional", "biographical", and "career preferences." It must be recognized, however, that these terms can refer to data which have been collected at very different levels of generality and precision. It is one thing to record the course names and numbers, and hours of special sessions or honors classes (as the MSIS does)

and quite another to measure the qualitative differences in education experience across classes, such as amount of direct informal contact with faculty, opportunity for independent study, and amount of interaction with other students on class work. Education is a process in which the minds, personalities, attitudes, and viewpoints of the persons involved interact dynamically in ways which produce changes in those persons, some of which are subtle and others of which are dramatic and obvious, but all of which have the potential for affecting the individual's future behavior, career plans, and life goals. The subtle influences on career plans within the field of medicine of such a complex process as educational experience cannot be assessed by dealing with that experience at the gross level of names of courses a student took. For administrative purposes that may be a very finely-honed measure, but for research purposes, where one must focus on the dynamics of psychic and social interaction, it is entirely inadequate.

The administrative measures contained in the MSIS, while they may be very useful for certain purposes, simply do not deal with educational experiences on a level which would permit the identification of those kinds of causal processes which are likely to be most significant in affecting career choices of students. To be effective in aiding policy decisions, research must be capable of determining and assessing relevant causal processes; otherwise the type of findings which result will make it difficult to recommend practical, realistic approaches to effecting changes in medical student career dispositions and subsequently in physician manpower distribution. Use of the MSIS measures for the CREAM would be analogous to doing research in cell biology with a reading lens instead of a microscope

-- one could not observe the relevant processes at the level of detail necessary even for distinguishing those processes.

Not all of the data in the MSIS are inadequate for the research purposes for which the CREAM was designed. There are a few data elements which, while they are not "ideal", could nevertheless be used if necessary. There are several factors which make such a possibility less than practical, however. First of all, there are relatively few such data elements. The ones which would be useful for the CREAM are limited to medical career plans and some biographical data. Second, the mechanics of merging data with the MSIS would be such as to require considerable time and effort on the part of the AAMC and CREAM staffs. Students entering the CREAM tracking system would have to be identified by name in the MSIS. Since computers often have difficulty recognizing different versions of the same name, this identification would have to involve other data elements as well. Once they had been identified, students would have to be given new ID numbers reflecting their sample group memberships in the CREAM. It is not unreasonable to assume that some student data would be missing in the MSIS, i.e., that information would not be available for all students. This would mean that for students with missing MSIS data, questionnaires would have to be devised for obtaining the missing data and entering it in the CREAM. It is also not unreasonable to suppose that not all of the data in the MSIS would be current. Some students may have changed schools, changed names, or changed addresses. All of these items would probably be used in identifying students across data bases, and the problems involved in straightening out such matters would be substantial. The worst that could happen in such cases would be that data might not be obtained at all from these students and that considerable

time would have been wasted in trying to locate and identify them correctly. The best that could be expected in such cases is that those students would be given their questionnaires late and their data would have to be added to the files separately from the rest of the data. Considerable time would be spent in the handling of cases which had to be processed separately from the rest of the data. Past experience in dealing with data files from "outside" sources has indicated that even under ideal conditions (which hardly ever occur) the time and expense involved in extracting the data from the files and converting it to a form useable for another research project can be substantial.

All of this is not to say that existing data files should never be used. The point here is that the merging of data files is not without its costs. These costs can be considerable, especially in terms of personnel time. In short, given the relatively limited amount of MSIS data which would be relevant for the CREAM, it would not appear worth the cost to attempt a merging of those files.

B. Sponsorship

The term sponsorship is used here to refer to the funding source which might support the CREAM or the service modules. There are three main points which will be discussed: available money from various sources; interests of various sources; and the image of various funding sources in the minds of the students who would participate in the system.

With respect to the CREAM, there would appear to be three possible sources of funds: medical schools, the federal government, and private foundations. The first source is a possible one, but only minimally so. Medical schools might find it possible to fund that part of the CREAM with

which their school was involved, and if enough schools would agree to fund the data collection at their school, it might be possible to undertake the tracking effort. The problems with this kind of funding are gigantic, however. The time required to coordinate the separate funding of each school so that parts of the system could be implemented all together at a specified time makes this a practically unfeasible alternative.

The federal government would appear to be the best candidate for funding the CREAM, partly because of the large amounts of monies which are sometimes available for such projects, but primarily because of its interests in the area of physician manpower and medical education. Whether or not funds could ever be committed to such a project as the CREAM would to a large extent depend on funding priorities within various federal agencies and allocations from Congress. Yet given that the necessary funds could be obtained, it would appear that the returns from the project would be of significant value for federal planning, policy-making, and funding decisions in the area of medical education. The CREAM as designed is not just a one-time quickie piece of research whose results would be out of date within a few years of the time they were reported. The CREAM would provide a valuable data base for dealing not only with today's questions in the fields of medical education and student career development, but also for dealing with questions relevant to the funding and policy decisions of tomorrow.

In terms of its image among students, however, the federal government is not in as good a position as are private foundations. As unfortunate and perhaps even as irrational as they may be, student attitudes towards the collection of personal data by the federal government are not very favorable. Yet they are a reality which must be taken into account in any

data collection which might be sponsored by federal funds. It is not that these attitudes would undermine the success of any such project, but merely that a sincere effort would have to be made to assure students of the confidentiality of the data and to be as open and honest with them as possible throughout the entire project.

The costs of the CREAM are not so high as to be beyond the resources of private foundations. Certainly the total estimated cost of three years is large (nearly .45 million dollars), but that would not seem to be the main issue. Perhaps of greater importance is the interest which such a project as the CREAM might have for foundations. In this respect the matter is a subtle one. Pure research has never been a major or even a minor focus of most of the foundations interested in the health care field. The CREAM is a research module, but it is an applied module which has the direct potential for discovering and illuminating methods and areas of physician training which have significant impacts on students' career preferences. Identifying the right kinds of students and providing them with the kinds of training experiences which would encourage them to enter practice in shortage areas is obviously one way of directly dealing with the physician maldistribution problem. The findings which would be available from the module would permit private foundations to direct their funds towards those kinds of programs whose effects had been verified empirically and which, on the basis of evidence rather than speculation, assumption, or ideology, appear to be the most effective means of influencing students to practice in underserved settings.

The image of private foundations in the eyes of medical students is more favorable than that of the federal government, and it seems apparent

that in this respect foundations would be the most desirable source of funding. This is only one consideration, however, and it must be weighed against the other concerns mentioned here.

The system described here is not limited to the CREAM, however. It includes service modules which meet a very real need in the area of student career decisions. In terms of their required development costs and foci, these modules would appear to be suitable for funding from either private or government sources. The SPACC might be of interest to states containing large areas lacking in adequate health care. While the need for the SPACC in such states as New Mexico and Alaska should be dramatically apparent, need is not necessarily a pursuasive or compelling argument to fiscally conservative state legislatures. Physician shortages may exist in some areas at least partly because efforts such as the SPACC have not been supported by state legislatures. At any rate, the probabilities of funding from the New Mexico state legislature, for example, are virtually nil.

C. Contractors

The term "contractors" is used here to refer to the staff which would be responsible for implementing any or all of the modules described above; the term is a slight misnomer since funding for the modules need not necessarily be in the form of a contract. The comments to be made in this section will be completely candid, primarily because it is thought that the relevant issues warrant such an approach.

The research group which undertakes the CREAM system and its associated service modules should be one which is experienced in the field of research in medical education. "Experienced" in this context does not mean merely

that the personnel should have conducted small-scale studies in such areas as "the effects of independent versus structured study programs on National Boards scores", or "the relationships between personality and attitude changes among undergraduate medical students", or "the effects on clinical skills development of instruction with programmed patients". It means that the research staff should have had extensive experience in a longitudinal study in which a considerable body of data has been collected on students over a lengthy period. This experience should include work with computer files containing large amounts of data and more than passing familiarity with the intricacies of multivariate research methods. Such experience is essential because the magnitude of effort involved in the CREAM does not leave room for learning by trial and error. Projects such as the CREAM are beyond the ordinary in behavioral science research and require a staff which can draw on an extensive background of experience. There are many past and existing projects in a variety of fields which, in terms of sheer numbers of data elements, surpass the CREAM, but there are very few which surpass it in the complexity of relationships among its data. For this reason alone, the project staff should be exceptionally qualified.

There are several projects and staffs around the country which are or have been engaged in longitudinal study projects and which, given only the above criteria, might be sufficiently experienced to undertake the system proposed here. This system is valuable enough in what it does and what is has the potential for doing, however, that additional criteria should be added. These criteria are that the group which implements the system should be comprised of persons whose major interests lie in applied research, who are not allied with any special interest group, and whose

primary concerns are in scientific investigation of the data and in providing students with services which meet their expressed needs (as opposed to their presumed needs as perceived by administrators who finished their medical training 20 years ago). In short, the system should be implemented by a group whose full-time interests are in research and the applications of that research -- not by a group which feels it must expend a substantial amount of its organizational energies on political purposes and image-building. The system proposed here is simply too valuable in its potential to be undertaken by a group which directs a substantial proportion of its efforts towards other arenas.

IX. EVALUATION

As described in earlier sections, the system proposed here includes no explicitly defined evaluation procedures. In the case of the service components, however, operations are included which could provide a direct basis for evaluating those modules. In the case of the CREAM, there are no operations which could be used directly for evaluating that module, but there are some general as well as specific criteria which could be applied for evaluation purposes. This section will discuss the criteria which might be used in evaluating the modules of this entire system, and, where appropriate, specify what data and/or operations existing in the system could be used in an evaluation effort. Cost estimates previously presented for the modules did not include evaluation, and no estimates will be made here of such costs.

A. Research Module

The CREAM may be evaluated on two different levels. The first level has to do with its general effectiveness in meeting its goals (see Table 3, Section IV) and in providing practical information which could be used as the basis for policy and funding decisions in the field of physician career development. Evaluation at this level must be mainly qualitative rather than quantitative and hence somewhat more subjective than at the other level or for other modules.

How adequate the CREAM is in achieving its goals is in large measure a function of its design. Its adequacy in this respect can be assessed against the following two questions:

1. Are the major variables and experiences which can be presumed to have effects on medical student career dispositions included in the study? Only by assessing a wide range of variables acting on students during their medical training can a study identify those aspects of physician training and career development processes which can be developed or elaborated in

ways which would have significant effects on physician manpower distribution in this country.

2. Are these variables and experiences embedded in the kind of design and given the kind of measurement which would make it possible to determine (a) the relative strengths of their separate effects on physician career dispositions, and (b) the influence of the complex relations and interactions among these experiences on career preferences?

The range of variables included and the design which is used in the CREAM are such as to make it possible not only to (a) determine which experiences have significant influences on student career paths, but also to (b) determine what specific features of these experiences seem to be decisive in producing the observed effects. It is this kind of information which would be very practical for guiding policy and funding decisions in medical education.

The second level on which the CREAM may be evaluated deals with the mechanics of the module's operation, or how well the design is implemented in practice. Several factors bear on this point, and again these will be set forth as questions against which the performance of the system could be assessed.

1. Is the student drop-out rate from the system kept at a low enough level that the comparisons, contrasts, and analyses required for achieving the system's purposes are left unimpaired?

2. Apart from sample losses due to students dropping out of school or declining to continue participating in the system, is the system able to "keep tabs" on students well enough that few students are lost simply because they cannot be located?

3. Are the files of the system flexible enough for data to be easily updated and retrieved so that project staff can spend their time studying the

the data instead of devoting large amounts of time to manipulating files in preparation for analyzing the data?

The first of these questions has to do with the ability of the system to generate and maintain student cooperation over the life span of the tracking effort. The second question is concerned with the functioning of the procedures for keeping track of students and locating them for purposes of ongoing assessment of their career paths. This is a particularly critical point once students have begun entering residencies and practices. The third question is concerned with the staff's ability to process and analyze the data. Two factors are relevant to this point: the design of the computer operations and file system; and the staff's ability to use these systems efficiently and effectively. This latter factor is one reason why an experienced staff is essential. Even with packaged software, there are numerous quirks and even errors within the packages themselves which can wreak havoc on data processing and analysis schedules. Only knowledge based on past experience can keep such program "bugs" from undermining a project's efforts.

B. Service Modules

The success of the service modules can be assessed in more concrete terms, with perhaps the exception of the WIM and the MBTI feedback. Again, there are two levels at which these modules may be evaluated.

The first level has to do with usage rates and placement successes. Assuming that students would not use the modules unless there was a need for them and unless the modules served that need, the computerized service modules (PIM, RIM, and SPACC) can be evaluated on the basis of the number of

persons using them and the rates of successful placement. The PIM, for example, can be assessed on the basis of the number of students who used the module compared to the number who were informed about it or given the opportunity to use the module. The placement rate can be figured on the basis of the number of actual placements through the system compared to the number of students who made use of the system's services. Such figures would have to be interpreted in context, since it might be that there were simply not enough preceptorship programs to meet student demand. Similar figures could be used for the RIM and the SPACC. All of the computerized modules as described earlier have built into them a means of keeping records of the number of users and number of placements.

The WIM and the MBTI, since they are not computerized, cannot be evaluated in terms of usage or placement rates. They can, along with the other modules, be evaluated at another level, however.

The second level of evaluation could look at user reactions to the modules. Questionnaires could be designed to obtain user satisfaction ratings. Such a questionnaire might cover various features of the modules, including the following examples:

1. adequate range of selection criteria;
2. adequacy of information provided about alternatives;
3. satisfaction with turn-around-time for information requests;
4. general parameters of the module (e.g., geographic area included, community size, specialties, etc.);
5. usefulness of the information for career decision-making.

None of the modules as described earlier have included provisions for assessing student responses of this nature, but such ratings would not be difficult to obtain were evaluations of this nature desired.

REFERENCES

1. Otis, G. D., Quenk, N., Weiss, J., Albert, M., Offir, J. & Richardson, C., "Medical Specialty Selection: A Review". DHEW Publication No. (NRA) 75-8, U. S. Department of Health, Education, and Welfare, Public Health Service, Health Resources Administration, 1974.

2. Otis, G. and Mitchell, W., "A Model of Physician Career Dispositions," Study Report No. 1, contract no. 1-MI-24197, prepared for the BHRD, Health Resources Administration, University of New Mexico, 1975.

3. Otis, G., Graham, J., and Thacher, L., "Typological Analysis of U.S. Medical Schools," Journal of Medical Education, 50, 1975, 328-338.

4. Morrissey, E., "Sources of Error in the Coding of Questionnaire Data," Sociological Methods and Research, 3, 1974, 209-232.

5. Kammeyer, K., and Roth, J., "Coding Responses of Open-ended Questions," pp. 60-78 in H. L. Costner (ed.) Sociological Methodology 1971. San Francisco: Jossey-Bass, 1971.

6. Scott, W., "Reliability of Content Analysis: The Case of Nominal Scale Coding," Public Opinion Quarterly, 19, 1955, 321-325.

GLOSSARY OF TERMS

NOTE: The definitions given here constitute the meanings of these terms as they have been used in this report. Some of these terms may have other, slightly different meanings in other contexts.

1. CASE
An entity which may serve as the definitional basis of records. These entities may vary, but in the system described in this report, cases will generally be either individual persons, communities, preceptorships, residency programs, or niches.

2. DATA BASE SYSTEM
A filing system containing coded information associated with cases from a specified population. The filing system may have any of several bases, e.g., alphabetical, chronological, ordered by selected characteristics, or a combination of these or other bases. The storage medium may vary from paper to magnetic tape; it may be machine readable or it may not be. The population may be persons, communities, or other entities of interest.

3. FILE
An organized system of records containing information about cases from a specified population. The records may be stored on any medium and arranged in any of a number of ways, depending on the purpose of the file. Generally speaking, a file is narrower in scope than a data base system in that it may contain information which is used for more restricted purposes. For example, a data base system may contain several files, each of which contains a restricted subset of information within the data base and may serve somewhat different purposes in the system.

4. MODULE
An information gathering and delivery system which (a) serves specific goals; (b) is addressed to the needs and situations of specific populations or groups, and (c) may be limited in scope to certain areas of knowledge or types of information. The delivery mechanism may involve computer operations, but this is not its defining characteristic. The delivery mechanism may take other forms which are more appropriate for the purposes served by the module.

5. NICHE
Any of the full or part-time employment possibilities which may be open to a physician. Niches may be differentiated on the basis of the five components which define them: (1) specialty; (2) type of work setting; (3) geographic area; (4) community size; (5) allocation of professional effort. Depending on the level of abstraction, niches may be discussed in terms of any combination of these components. If only two components are mentioned, for example specialty and work setting, then it may be assumed either (a) that the comments apply across geographic areas, community sizes, etc., or (b) that the data are aggregated across the other components.

6. OPPORTUNITY STRUCTURE
As used in this report, this term refers to the opportunities a medical student may have for taking preceptorships as a result of the personal and institutional circumstances in which he finds himself.

7. PRECEPTORSHIP
A training experience for undergraduate medical students which may involve either (a) limited patient care and practice activities under the supervision of a licensed physician, or (b) observation of such activities as performed in the practice setting of a licensed physician. In general, both types of preceptorship occur outside of the medical school setting.

8. RECORD
A specified body of information stored in a file or in a data base system. The specifications which define the record may vary, but in this report, records are presumed to be defined on the basis of cases. Thus, a record would be a body of information about a specific case.

APPENDIX A

Summary of MBTI Concepts

From "Introduction to Type"
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OPPOSITE KINDS OF PERCEPTION AND JUDGMENT

The Type Indicator is concerned with the valuable differences in people that result from the way they like to perceive and the way they like to judge. Succeeding at anything takes both perception and judgment. First you have to find out what the problem or situation is and what are the various things you might do about it. Then you have to decide which to do. You have two basic ways of finding out, and two basic ways of deciding.

OPPOSITE WAYS OF FINDING OUT

One way to find out is through your sensing. Your eyes and ears and other senses tell you what is actually there and actually happening. Sensing is especially useful for seeing the facts of a situation. The other way of finding out is through your intuition, which shows you meanings and relationships and possibilities that are beyond the reach of your senses. Intuition is especially useful for seeing what you might do about a situation. You use both sensing and intuition, of course, but not both at once and not, in most cases, with equal liking.

If you like sensing better than intuition, you make more use of sensing, become more skillful with it, and grow expert at noticing all the observable facts. You tend to be realistic, practical, observant, fun-loving, and good at remembering a great number of facts and working with them.

If you like intuition better than sensing, you make more use of intuition, become more skillful with it, and grow expert at seeing a new possibility or solution. You tend to value imagination and inspirations, and to be good at new ideas, projects and problem-solving.

OPPOSITE WAYS OF DECIDING

One way to decide is through your thinking. Thinking predicts the logical result of any particular action you may take. Then it decides impersonally, on the basis of cause and effect. The other way of deciding is through your feeling. Feeling takes into account anything that matters or is important to you or to other people (without requiring it to be logical), and decides on the basis of personal values. You use both thinking and feeling, of course, but not both at once and not, in most cases, with equal confidence.

If you trust thinking more than feeling and use it more, you grow to be most skillful in dealing with the part of the world which behaves logically (like machinery) with no unpredictable personal reactions. You yourself tend to be logical, objective and consistent, and to analyze and weigh the facts, including the unpleasant ones, when making any decision.

If you trust and use feeling more than thinking, you grow most skillful in dealing with people. You tend to be sympathetic, appreciative and tactful and to give great weight, when making any decision, to the personal values that are involved, including those of other people.

The kind of perception you prefer to use, either sensing or intuition, can team up with whichever kind of judgment you prefer to use, either thinking or feeling. So there are four possible combinations, each producing a different set of characteristics - different interest, different values, different needs, different habits of mind and different surface traits.

EFFECTS OF THE COMBINATIONS OF PERCEPTION AND JUDGMENT

SENSING PLUS THINKING

The ST people are mainly interested in facts, since facts are what can be collected and verified directly by the senses, by seeing, hearing, touching, etc. And they make decisions on these facts by impersonal analysis, because what they trust is thinking, with its step-by-step process of reasoning from cause to effect, from premise to conclusion.

SENSING PLUS FEELING

The SF people are also interested in facts, but make their decisions with personal warmth, because what they trust is feeling, with its power to weigh how much things matter to themselves and others.

INTUITION PLUS FEELING

The NF people judge with the same personal warmth. But since they prefer intuition, their interest is not in facts but in possibilities, such as new projects, things that have not happened but might be made to happen, new truths that are not yet known but might be found out, or, above all, new possibilities for people.

INTUITION PLUS THINKING

The NT people share the interest in possibilities. But since they prefer thinking, they approach these with impersonal analysis. Often the possibility they choose is a theoretical, technical or executive one, with the human element more or less ignored.

	ST	SF	NF	NT
People who prefer	SENSING + THINKING	SENSING + FEELING	INTUITION + FEELING	INTUITION + THINKING
focus their attention on	Facts	Facts	Possibilities	Possibilities
and handle these with	Impersonal analysis	Personal warmth	Personal warmth	Impersonal analysis
Thus they tend to be	Practical and matter-of-fact	Sociable and friendly	Enthusiastic & insightful	Logical and ingenious
and find scope for their abilities in	Production Construction Accounting Business Economics Law Surgery Etc.	Sales Service Customer relations Welfare work Nursing Gen. Practice Etc.	Research Teaching Preaching Counseling Writing Psychology Psychiatry Etc.	Research Science Invention Securities analysis Management Pathology Etc.

If you can tell which column comes closest to describing you, you can tell which two of the four processes (sensing, intuition, thinking and feeling) you naturally use the most. One of those two will be your favorite process. The other is the "auxiliary", that supplies perception if the favorite is judging, or judgment if the favorite is perceptive. Your greatest strengths come from the two you like, and it is important to trust and develop them. But for some purposes your less-liked kinds of perception and judgment will serve you much better -- if you remember and take the trouble to use them.

OUTER WORLD OR INNER WORLD

Your main fields of interest are apt to be directly related to the kind of perception and kind of judgment you prefer. But the sort of work you will most enjoy doing within those fields may depend on another preference, -- whether you like to use your favorite process extravertedly in the outer world of people and things, or introvertedly in the inner world of concepts and ideas.

Take the ST people for example. The introverts among them (IST) like to organize facts and principles related to a situation, which is the useful thing to do in economics or law. The extraverts among them (EST) like to organize the situation itself (including any idle bystanders) and get it moving, which is the useful thing to do in business or industry.

Jung, who invented the terms, looked upon extraversion and introversion as valuable opposites, which everyone uses but not with equal ease. Extraverts tend to be more interested and comfortable when they are working actively with people or things. Introverts tend to be more interested and comfortable when their work involves ideas and requires a good deal of their activity to take place quietly inside their heads.

JUDGING ATTITUDE OR PERCEPTIVE ATTITUDE toward the outer world.

The final preference is between the use of perception and the use of judgment in dealing with the outer world. The J people rely mainly on a judging process for this purpose (T or F, whichever they prefer), and live in a planned, decided, orderly way, aiming to regulate life and control it. The P people rely mainly on a perceptive process (S or N) for dealing with the outer world, and live in a flexible, spontaneous way, aiming to understand life and adapt to it.

This JP process works differently with extraverts and introverts. With

extraverts the favorite process is, by definition, the one they prefer to use in the outer world. So the extraverts' favorite process is what registers on the JP preference. Extraverts whose favorite process is a judging one come out J. Extraverts whose favorite process is a perceptive one come out P.

With introverts the favorite process is, by definition, the one they prefer to use in the inner world. They do their extraverting mostly with their auxiliary. So their auxiliary is what registers. Introverts whose favorite process is a judging one come out P because their auxiliary is perceptive. And introverts whose favorite process is a perceptive one come out J.

SUMMARY OF THE FOUR PREFERENCES

Your type is the result of your own combination of preferences, which can be stated for convenience in four letters. For example, ISTJ means an introvert liking sensing and thinking and a mainly judging attitude toward the outer world. ENFP means an extravert liking intuition and feeling and a mainly perceptive attitude toward the outer world. (N is used for intuition because I stands for introversion.)

EI Preference

Extraversion — Introversion

SN Preference

Sensing — Intuition

TF Preference

Thinking — Feeling

JP Preference

Judgment — Perception

Percent Responses for each Module

N=475 Medical Students

CAREER INFORMATION SERVICE SYSTEM QUESTIONNAIRE

Your present year in Medical School _____

The AMSA Foundation is interested in assessing the need for career information services to medical students and physicians. The paragraphs below describe the present thinking about such information systems. Assuming that these information services satisfied the needs of confidentiality and protection of your privacy, please indicate by circling YES or NO, whether you would use such systems if available at appropriate stages of your career.

1. This proposed system would allow the user (medical student or physician) to ask for information about his (her) own personal attributes, focussing on personal preferences and personality characteristics which have been found highly relevant to career decisions. This information would be provided in the form of a written description of the user's personal attributes.

YES	NO
67%	33%

2. This proposed system would allow the user to request information about the characteristics of medical specialties and work settings. This would include information such as average income, typical patient loads, frequency of medical activities and other practice characteristics, as well as factors which physicians working is a specialty and/or work setting find satisfying and dissatisfying. This information would be provided to the user in the form of detailed descriptions of each specialty and work setting requested or specialty/work setting combinations.

YES	NO
96%	4%

3. This proposed system would allow the user to request information about the relationship between his (her) own personal attributes and the characteristics of medical specialties and work settings. This would include such information as the frequency with which a specialty or work setting attracts physicians with the user's personal attributes and the degree of career satisfaction reported by physicians with these attributes who practice a particular specialty in a particular work setting. This information would be provided in the form of detailed descriptions of such relationships for each specialty and/or work setting selected.

YES	NO
72%	28%

4. This proposed system would search out opportunities for medical student career exploration in the form of current opportunities for direct experience in particular kinds of medical settings. Information would be provided about such opportunities as summer preceptorships in primary care, research experience in different specialty areas, placements in surgical facilities, etc. The user would indicate his (her) interests in the area of direct experience and the system would provide information in the form of detailed descriptions of all opportunities which meet the user's selection criteria.

YES	NO
92%	8%

5. This proposed system would provide information about training program opportunities (e.g. internships and residencies) in the user's chosen field of interest. Such information as average salary, call schedules, trainee/faculty ratio and program emphasis would be provided. Also included would be ratings of the program by former participants. Users would request information about all programs meeting their desired criteria and/or information about placements in particular program in which they were interested.

YES	NO
98%	2%

6. This proposed system would serve as a career placement service which would allow the user to request information about physician career opportunities after completion of training. The user would provide his (her) requirements in terms of such factors as geographic area and community size, practice organization, desired income, patient population characteristics and life style factors. The system would also function to locate other physicians looking for partners to form particular kinds of practices in particular locations. Information about career opportunities in government programs and institutional settings would also be available. Information would be provided to the user in the form of detailed descriptions of all opportunities which meet his (her) selection requirements.

YES	NO
94%	6%

PLEASE USE THE REMAINING SPACE TO INDICATE YOUR SUGGESTIONS AND COMMENTS ABOUT THESE PROPOSED INFORMATION SERVICES. WE WOULD ALSO BE MOST INTERESTED IN WHICH AREAS OF CAREER DECISION-MAKING APPEAR MOST DIFFICULT FOR YOU.

Comments:

A RANDOM 5% SELECTION OF RESPONSE COMMENTS
RECEIVED FROM STUDENTS ON THE
CAREER DEVELOPMENT INFORMATION SYSTEM SURVEY

Year of
Medical School

3 I think that this is a GREAT idea. As a 3rd year student the time is nearing when I need to decide on a career choice. Presently, I couldn't do this with any degree of comfort. A program like this would be ideal in this (and other) settings.

2 This sounds like a major undertaking and my primary concern would be obtaining funds and co-operation from medical personnel involved as well as receiving information from those students interested in your program.

3 You know, just the other day I was asking about where a good place to go would be, and it just seemed like nobody could answer my question. Yes sir, I was talking with some other folks, and they didn't know either. These young kids with their ideas are damn fine kids in my book and I'm right behind them yes I am.

4 All excellent ideas -- they would make the hassle of career opportunity, decision, etc. a lot less uncertain.

3 Please let me know where I can obtain such information now: (name and address included)

2 All those I selected sound as if they would be very helpful in any sort of decision; however, at this time I've not begun to consider even beyond the next two years, and so I can't say which sounds most helpful, as I have encountered any problems yet.

2 Hurry up!

2 Being interested in a family practice, especially one in physician shortage areas, I would be interested in discovering the types of residencies which would be most beneficial in providing such training that such plans might necessitate, i.e. training in internal medicine.

It is my understanding that current family practice residencies fall short of expectations.

2 Your plan sounds excellent. I will be looking forward to seeing it put into action!

2 I haven't made many career decisions in medicine -- therefore I don't know what's difficult but am apprehensive about making them.

(Post AMSA Nursing Student)

I would suggest a similar effort for nursing and other health oriented professionals with the onset of their newfound credibility and skills, i.e. nurse practitioners.

I think #3 would be the hardest and least accurate information to obtain.

Year of Medical School	
3	There is entirely too little of career-oriented information available to the medical student attempting to choose which field to enter. I only hope that some of the above ideas could be implemented soon enough to help me in my career choice.
2	Would it be free, open to all; how much would it cost?
2	You mean there isn't a service like this already. There should be. Right now, a residency is of prime concern to me -- I want to know everything about how to secure one, especially an extended residency.
2	I find the career-making decision hardest in terms of my own inexperience and lack of specialty knowledge. That is most of the information (all of the information, probably) that one gains in the first two years is second-hand. This can be misleading in the respect that a teacher whom you admire can show your attitude about career choice due to the disproportionate amount of "pricks" that one runs across teaching medicine. Also most of the information about different programs must be ferreted out by one's self. The whole thing seems to be run by word of mouth particularly in relation to "prestige" programs. One hears constantly that Dr. So-and-so went through this program or that it's really supposed to mean something about their ability in that field. This whole community gestalt is real but there seems little practical about evaluating it subjectively. What if one found out the whole system was at fault.
3	Good ideas, I believe. Must maintain privacy and confidentiality.
--	Most difficult decision: LOCATION
3	I hope that the predictive ability, i.e., that a person with this set of characteristics does best at this particular activity, is not used as a means to select applicants for particular jobs. This information should be available only to the Medical Student or M.D. not to the hiring agency.
2	How about the less objective questions people have concerning training programs -- factors satisfying and dissatisfying to those in the programs at present -- (additional to idea #5).
2	In theory the program sounds workable but if this plan is extended, as implied, to even choosing one's partners I hope the plan is amenable to the task. Too many variables are involved in making any relationship work that a simple questionnaire seems a little lacking for the job. But on a broader (specialty choosing) level the system would be of great benefit.
4	Any help in career information is very helpful especially if it can be geared to the personality and preference.
2	I think the above propositions are good ones in helping students have some idea and direction about various fields of medicine. Personally, I'm beginning to wonder what fields I should consider based upon my abilities and what I want out of practicing medicine. Therefore, generally I feel this would be an excellent opportunity to try and help to settle some enormous career specialties and their decision-making.

Year of Medical School	
1	Being a first year student, I haven't yet made any commitments to myself in terms of specialty training, but I would be interested in getting specific information and perhaps opportunities to experience the various fields in other than the medical school setting.
1	All programs are needed. However, 1 and 3 are the most difficult to assess and in my opinion the least needed. Particularly interested in 4,5,6.
1	Hard to assess, but a doctor-needed index would be helpful.
2	How much is this going to cost?
1	Proposal #3 seems as if it goes too far toward making the decision for individual, based on criteria which may or may not be valid. I believe this should be a personal decision, based on a large variety of fairly objective information rather than these aspects of your personality, etc., limit you to these areas.
2	Areas of career decision-making that give me difficulty or worry are: (1) potential lack of stimulation and challenge if I go into something broad and miss out on depth, or if I choose a specialty and end up going into depth but lacking breadth; (2) ability to manage time and/or demands so that I have time for a personal like with family and outside interests (I'm no martyr!) I think the proposed system has a lot of merits and could do much in spreading valuable information.
1	Most difficult career decision at this time (1st year) is whether or not to seek financial aid from a source that would require a commitment of service for two or more years. An information service might include information about PHS, military, and state programs which require such commitments - i.e., descriptions of practice settings, degree of satisfaction, etc.
4	Most helpful to me was the AMSA-NHSC Preceptorship Program which provided me with a great deal of insight in an area about which I had little or no information. Many medical schools are oriented in one direction or another, i.e., academic, etc. This polarization of training and training environment results in medical students making career choices before all the data is in. The proposed AMSA information service would do well to try and fill this gap.
2	(1) desire to achieve a balance between my career and family so neither is slighted. (2) desire to select a specialty which provides variety, interest and challenge without sacrificing competency (i.e., the family practice situation where the physician knows a little about everything but nothing well.)
1	I think such information and services would be a great asset to medical students. At this point in my career it appears that the most difficult decision will be (1) which area of medicine to practice and (2) where I would like to practice after doing residency training (this includes deciding geographical location of practice and type of practice - hospital, clinic, partnership, etc.)

Year of Medical School	
2	I like the ideas expressed in most of the proposals. It seems to me that 3 different base areas need to be covered if you want to be comprehensive. First you need an information service that would let the student still in school know what opportunities are available so this could help him in their choice of specialty - post grad training. This seems to be covered pretty well in proposals 1 & 2. Then the idea of making preceptorships, etc. known in la proposal #4, as well as internships. #5 is a great idea and would cut down on much confusion in making those decisions. Then thirdly, #6 would help the already decided M.D. find less than hypothetical places to go. It would be a big job to cover these all effectively but it would be a very valuable service to the aspiring M.D.
2	The proposed system sounds excellent! The resource capabilities seem quite good. The only comment I would have on this system is that in order for it to function effectively strict confidentiality must be maintained! Since I am a second year student I have not yet begun to consider a particular career. As a result I have not yet run into any career decision-making difficulties but when the time comes I would seriously consider making use of the proposed system.
3	The points of decision-making mentioned in numbers 3, 4, and 5 are especially interesting to me. Right now I'm trying to formulate a 4th year program which will hopefully expose me to a learning, role-modeling experience different from those presented by the medical center environment.
2	With respect to question #4 -- a first or second year med student, in my opinion, should offer himself a fairly broad exposure of medical specialties and not limit himself that soon to one only. A fair amount of broad exposure is needed before making a legitimate decision on career goals. Therefore, although early clinical exposure is stressed, I would make it a varied not a limited one with respect to summer programs.
4	I would agree with all the proposals except the third. We cannot and should not match students and careers based on past stereotypes -- that would only serve to impede the process of opening all fields to physicians of all backgrounds and interests.
2	At the present time in my training I am very interested in learning about various residencies and training programs. But I don't know where to go to find the information I desire. I think that the proposed system as stated above (especially those parts ciecled "yes") would be of great help to me and other students. I wish such a system already existed.
2	I think that informed decisions require information that your "proposed system" could provide efficiently. Obviously, developing comprehensive and current information bakns would be expensive. Problems might arise in terms of cost/benefit analysis, or in the area of confidentiality, exp. in system #1.

Year of Medical School	
1	Program seems very well organized. It might be useful to emphasize similarities and differences between large metro and small community practices in all specialties. Good accurage generalities that are meaningful info would be invaluable to someone starting out. Also, publication of areas of need would be helpful. There is so much talk about shortage of doctors in needy areas but I've never seen a listing of these areas published. There might be real interest in some area that a future physician never know about.
2	I really could appreciate the info on education opportunities outside my college. These are so hard to find.
2	I believe that the most important service such a system could render is to give students an idea of what such specialties are really like to live with: how is time spent, hours, patient relationships, salary, opportunities, etc. (#2 and #5).
4	My yes answer to #5 is really a maybe -- I prefer my own spade work in this area. I'd like #6 better if it deemphasized private practice options. My major hassle re career was family vs: internal medicine -- much negative pressure from subspecialties at my East Coast medical school. (I picked F.P., by the way). Doubt the computer could help -- but it would be useful to know about hospital practice/privileges of FP's nationwide, amount of admissions for medicine, peds, OB which FP's generate, whether they retain control over patients, etc.
--	Duke U.: At present time many students are all ill informed about what is awaiting them in the future residency programs subsequently careers. Many had no outside field experience and/or are not aware of such opportunities. Students who have the extra incentive or "connections" can usually get more information on preceptorships, residencies, etc. but this system, if it would work properly, would be an ideal info center for the great majority of medical students.
3	1) It might be difficult to convince the user of the conficentiality and privacy required to make the system work. 2) Can you really justify the expense involved with getting the enormous data base and accurate sampling systems necessary to occue in the next decade. Career decision-making problems: 1) Matching my strengths to the demands of specialties. 2) Having no good feel for projected medical needs and resources of the future. 3) Having too little idea of how to evaluate the realtive academic worth of post-graduate training programs, other than polling the subjective opinions of local faculty members.

Year of Medical School	
2	I certainly believe that the participating student should have full details concerning safe-guards of personal information that he supplies. He should also know to what extend and who will have access to this information. The plan sounds very ambitious but could reduce much confusion about each step along the profession preparation pathway.
3	This information system is a good idea. It is hard to get a good idea of what you might like to do until you start doing it, but this system would seem to help alleviate this problem. Right now, I have no specific area of medicine in mind, and the most difficult thing for me is to try to decide how long to continue trying to get a broad idea of the various aspects of medicine before selecting a particular interest to pursue.
4	#4 & 5: Most important and practical for students. Area of career decision making most difficult for me now is academic vs. outside practice. However, so far, decisions have been easy once I reached the time to make them.
4 (Nursing)	Where to work What area Degree of questioning physician
3	I am interested chiefly in primary care; however, it seems that there is much controversy in exactly what fields constitutes primary care. It would be nice if a clearer definition was established and this used when describing a particular field. Another idea which seems difficult is the area of family practice. What should constitute family practice seems to vary and this is understandable in that physicians in this field may have different interests. What would be nice, especially in different locales, etc., would be a clear outline of the flexibility of a program or specialty.
2	People would be better served if there are a variety of personalities in any particular specialty. I feel it would tend to place all one kind of personality into a particular specialty; this would be a negative effect since various people - different personalities need a specialist (field surgeon, internist, GP, etc.) All the other proposals are great. I will choose a career in an area that I feel comfortable with and which I can master. The most difficult problem is trying to find out what is available, where, and how does one go about getting it. I feel that this is the area where your approach would be most beneficial.
2	Theoretically, this all sounds quite nice. A few questions: How long would implementing such a program take? It would seem to require rather a lot of time to amass such a large amount of information. How do you plan to find out all these things? How often would the information be updated? How is it proposed to finance the proposed system? About item #1, who is going to provide the information about the user?
4	Why is this not available now? It's too late for me!!!